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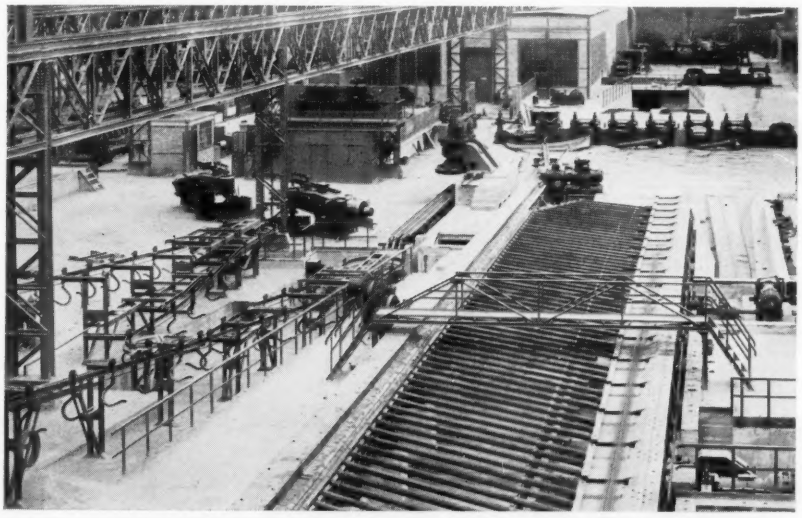

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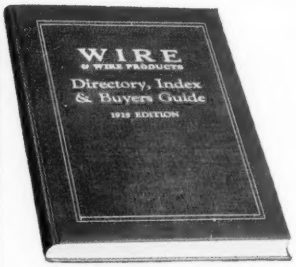

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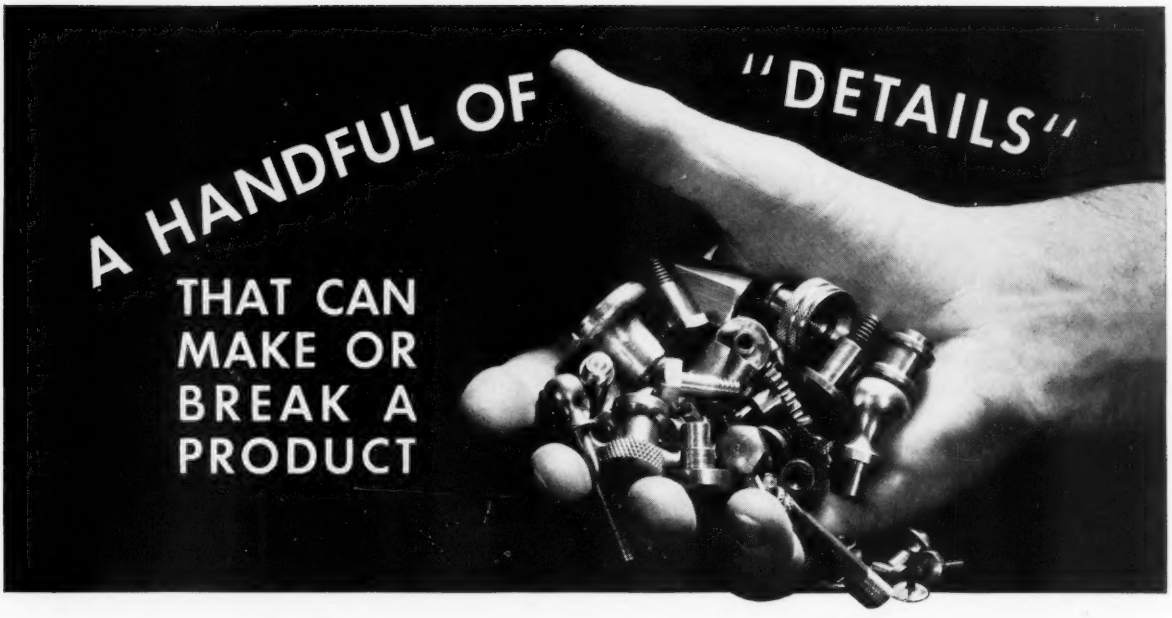

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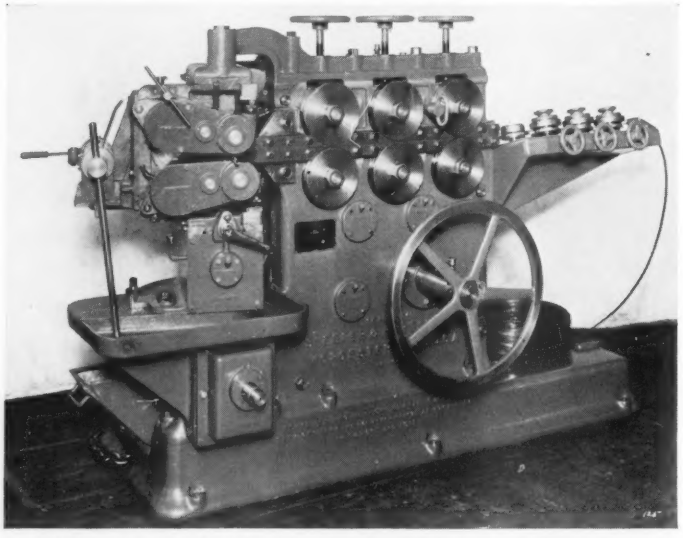

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip Wire Products and Insulated Wire and Cable.

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 9 February 1934 No. 2

Designated as

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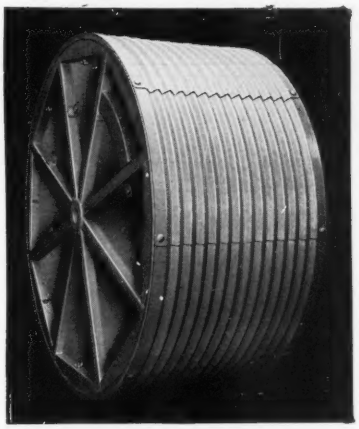

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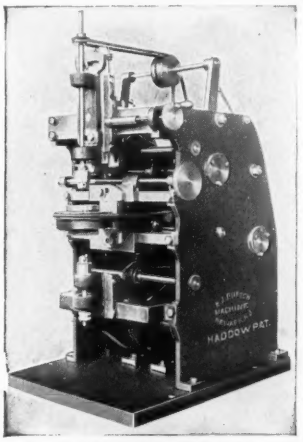

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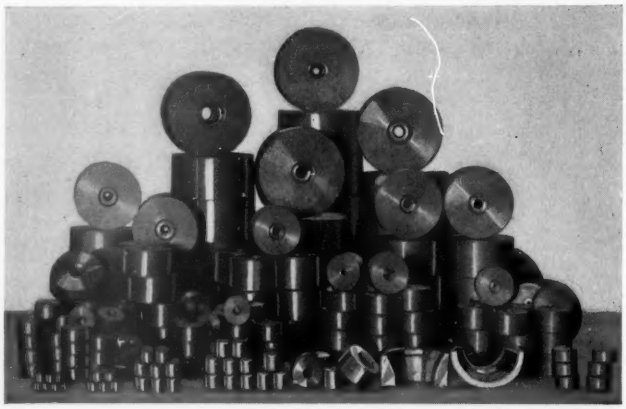

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING --- EXTRUDING --- FORMING --- FABRICATING

Vol. 9 February 1934 No. 2

Annealing Low Carbon Steel Wire

By Theo. B. Bechtel
Engineer, The Electric Furnace Co.,
Salem, Ohio

New Fuel-Fired furnace shows improved fuel economy. A more uniform anneal and decreased annealing time.

OF the several operations carried out in the production of low carbon steel wire, that of annealing remains, in most plants, the least satisfactory, chiefly because of the long time required for the operation, poor fuel economy and general lack of uniformity of results obtained.

✦ ✦ ✦

FROM time to time efforts have been made to improve conditions by such means as alteration of the firing arrangements and substitution of oil or gas for coal as the fuel consumed, aiming to improve the temperature distribution and at the same time reduce the fuel cost, if possible. Likewise, substitutions of rolled steel pots of lighter section and of heat resisting alloy pots have been attempted from time to time with more or less success.

✦ ✦ ✦

HOWEVER, these sporadic efforts have, in the main, accomplished little to improve the wire annealing problem as a whole. Most mills continue to use pots weighing, in some cases, two or three times as much as the charge itself. Necessity requires that these pots remain in the pit until partially cooled before they may be removed, so that the use of the furnace is lost during this partial cooling. Further, more time is lost during the subsequent heat in putting back into the furnace the heat lost in this cooling period. Likewise, this means wasted fuel as well as time, all of which is further increased by the additional time and fuel for heating, and the increased time for cooling and heavy walled steel pots.

✦ ✦ ✦

History of New Developments

SOMETIME ago a Midwestern Wire Mill decided to improve its annealing practice, and reviewed the above facts. Quality of the anneal was of course given paramount consideration, it being recognized that the effects of improved uniformity of product would be more far reaching than any other single factor. At the same time it appeared that the most important change to the equipment which could be made would be with reference to the time factor for furnace usage. In other words, if the furnace might be used for heating only, its effectiveness would be greatly increased.

✦ ✦ ✦

IN order to do this it was necessary, of course, to devise a pot design, and a means which would permit the pot to be lifted from the furnace while hot, and without excessive strains such as would cause undue pot maintenance. This, of course, pointed to the necessity of a light pot, preferably of heat resisting alloy in order to retain sufficient of its strength while hot, to permit of handling. Such pot being thin walled, and light, would therefore require less time and less fuel to heat, and due to its thinness would require less temperature gradient between furnace chamber and wire within the pot to adequately force the heat into the charge in a reasonable time.

✦ ✦ ✦

AS a result, an ingenious method was devised by means of which the pot and its contained charge may be removed from the

furnace while at maximum temperature, but each is independently supported, so that the light pot has only its own weight to carry, although it surrounds the charge at all time during the operation, protecting the wire from excessive scaling. At the same time, improvements were made in the furnace firing arrangement, so that uniformity of temperature throughout the furnace chamber might be assured.

✦ ✦ ✦

Improved Results

AS might be expected, the results were a considerable decrease in time required for the entire heating and cooling cycle, and greatly reduced fuel consumption per ton of wire annealed. Since the wire is above the scaling range for a shorter time, the surface condition of the product is likewise improved and loss of metal as "scale" reduced.

✦ ✦ ✦

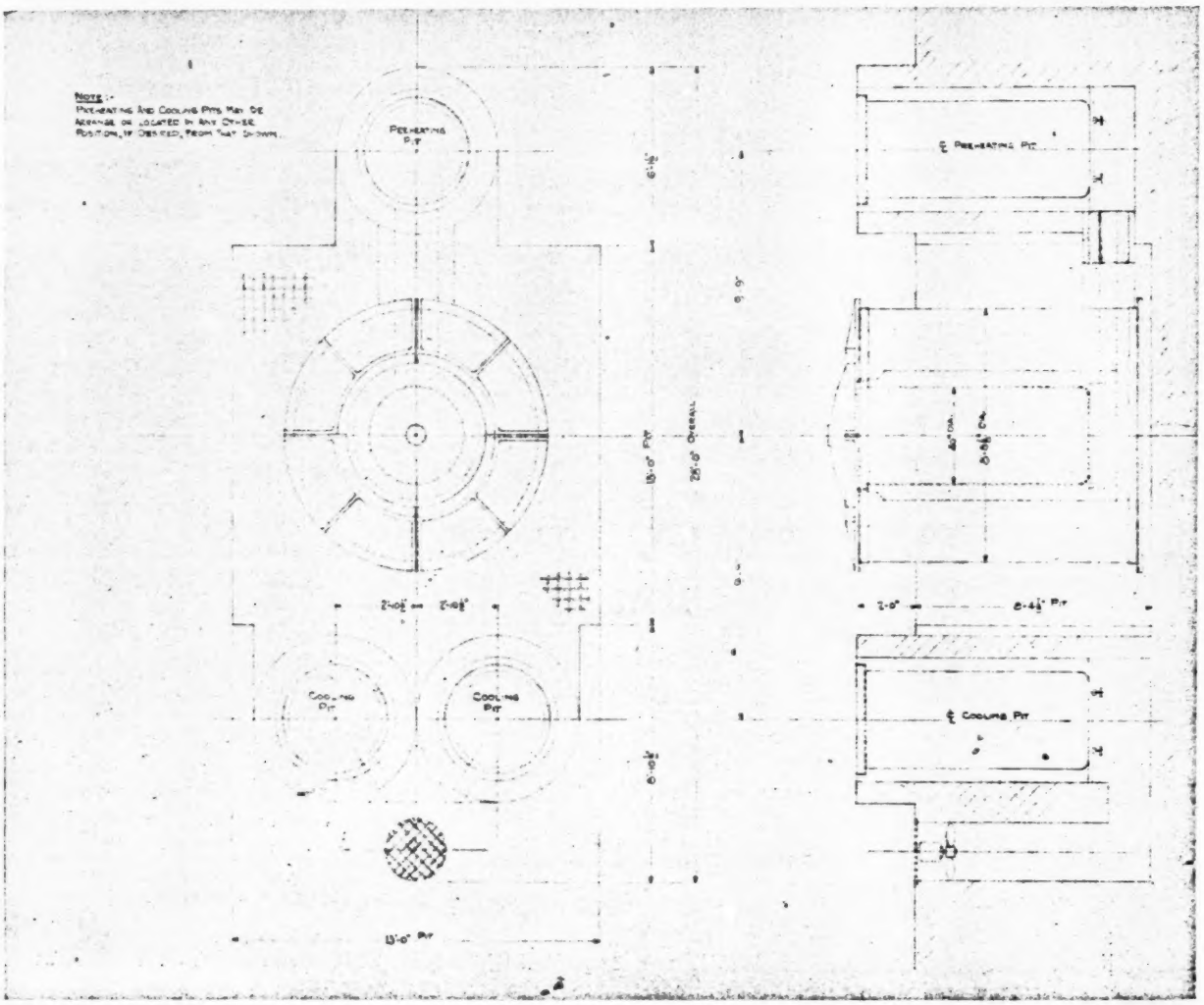
THE firing means are so arranged as to provide the flexibility necessary to handle a wide range of wire sizes, and to permit of ready compensation for the "slumping" of the wire in the pot, as it becomes heated. Also, with the pot arrangement, it is possible to produce coils with a high degree of roundness, where desired, and it has also been observed that there is a total absence of any welding or sticking of coils or strands.

✦ ✦ ✦

Uniformity of Product

INCREASED die life and less breakage in the dies, with increased yield, are important benefits experienced with process wire, following the improved annealing. However, it is in the fabrication of the wire into its ultimate product that the uniformity of annealing is most appreciated, and where the benefits of accurate annealing equipment are of the greatest value. As a matter of fact, uniformity may be said to be the most important characteristic of wire, and proper annealing is not to be overlooked as an important contributing factor to this desired uniformity. On this basis alone most operators will agree that the replacement of poor existing annealing equipment by modern equipment capable of a uniform product will amply repay the cost in the elimination of troubles and complaints.

(*Please turn to page 58*)



Controlling Accidents in Wire Products Operations

By R. R. Howard

National Safety Council

A comparison of the accident frequency records of rod and wire mills compiled by the National Safety Council. Some splendid no-accident records have been made by wire and wire products mills as compared to the other operating departments of the steel industry.

HOW do wire mills, or wire departments of mills, compare with other operating divisions of the steel industry in the number and severity of their accidents? How do different companies, within their department of wire mill operations, compare in their accident experience? And what are the companies with the best safety records doing, in a practical way, to control their accident hazards?

✦ ✦ ✦

IT might be mentioned, first, that some splendid no-accident records have been made by wire and rod, and by wire products mills, as compared to the best safety record made in other operating departments of the steel industry. For example, the **Wickwire Spencer Steel Company, Morgan Works,** at Worcester, Mass., operated for a continuous period of 1,354,580 man-hours, which terminated on May 3, 1933, without a lost time accident.

✦ ✦ ✦

LIKEWISE the Wire Products Division of **Westinghouse Lamp Company, Bloomfield, N. J.,** had on November 30, 1933 operated for a continuous period of 1,356,664 man-hours without a lost time injury.

✦ ✦ ✦

THESE records compare very favorably with the outstanding 1932 no-injury records in other departments of the steel industry, as recorded in "1932 Accidental Injury Rates in the Steel Industry" published by the National Safety Council. These records are shown in Table A.

LIKEWISE, a number of splendid records have been reported on the "Honor Roll for 1932" among "miscellaneous metal products industries," as reported in the "1932 Accidental Injury Rates in the Metals Products Industries" published by the National Safety Council. These include:

✦ ✦ ✦

1. **Collyer Insulated Wire Company, Pawtucket, R. I.,** which made the lowest accident frequency rate among all the large plants in this division which reported their 1932 accident experience to the National Safety Council (a rate of 1.48) ; and also the lowest 1932 accident severity rate (a rate of .001).

TABLE A

Department	No-Injury Record (Man-Hours)
Coke Plants	610,000
Ferro alloys and alloy steel	578,000
Merchant mills	548,000
General mechanical	538,000
Blast Furnaces	473,000
Open Hearth	430,000
Sheet Mills	290,000
Blooming and billet mills	238,000
General labor	216,000
Seamless tube mills	146,000

Disabling Injuries, 1932, Miscellaneous Metal Products Industries, by Industrial Groups.

INDUSTRIAL GROUP	No. of Industrial Units	Man-Hours Worked (Thousands)	Average Number of Employees	NO. DISABLING INJURIES				NUMBER OF DAYS LOST				INJURY RATES	
				Death & Perm. Total	Perm. Partial	Temporary	TOTAL	Death & Perm. Total	Perm. Partial	Temporary	TOTAL	Frequency	Severity
ALL GROUPS	200	81,901	52,552	5	57	1,023	1,085	30,000	29,425	20,223	79,648	13.25	.97
Jewelry Manufacturing	22	8,022	5,453	0	0	32	32	0	0	451	451	3.99	.05
Wire Drawing	35	22,276	13,555	2	23	187	212	12,000	9,841	3,585	25,426	9.52	1.14
Chain Manufacturing	7	1,180	732	0	1	13	14	0	300	208	508	11.86	.43
Bolt and Nut Manufacturing	16	5,661	3,582	1	3	67	71	6,000	990	1,568	8,558	12.11	1.46
Valves, Pipe Fittings, Radiators & Similar Products	22	20,885	14,663	1	20	256	277	6,000	10,859	5,839	22,698	13.26	1.09
Wire Products	26	7,927	4,935	0	3	115	118	0	1,525	2,476	4,001	14.89	.50
Drop Forgings	14	2,573	1,749	0	2	56	58	0	3,210	776	3,986	22.54	1.55
Structural Steel Fabricators	21	4,472	2,348	0	4	144	148	0	1,500	2,735	4,235	33.09	.95
Boiler Shops	12	1,806	1,054	0	0	81	81	0	0	957	957	44.85	.53
Not Otherwise Classified	25	6,899	4,511	1	1	72	74	6,000	1,200	1,628	8,828.	10.73	1.28

2. Aluminum Company of Canada, Ltd., Montreal, Canada. The Wire Plant of this company was the largest among all the companies in the "small plant" group which reported their 1932 accident experience, to achieve a perfect 1932 accident record—168,000 man-hours. Also, this was the largest company in the group to improve its 1932 accident record over 1931 and to achieve a perfect 1932 accident record.

✦ ✦ ✦

IN that division of the Metals Products Industries which is classified as "Miscellaneous metal products industries," a total of 200 industrial units, with an average of 52,552 employees who worked a total of 81,901,000 man-hours, reported their 1932 accident experience to the National Safety Council. These 200 companies were divided into the following ten different groups:

Jewelry Manufacturing
Wire Drawing
Chain Manufacturing
Bolt and Nut Manufacturing
Valves, Pipe Fittings, Radiators and Similar Products
Wire Products
Drop Forgings
Structural Steel Fabricators
Boiler Shops
not otherwise classified.

✦ ✦ ✦

THESE groups, incidentally, have been named in the order of their lowest average 1932 accident frequency rates. Thus, the thirty-five "wire drawing" units which employed an average of 13,555 workers (more than one-fourth of the total number of workers for all of the 10 groups) achieved a 1932 accident frequency rate which was excelled only by the twenty-two units in the jewelry manufacturing group with 5,453 employees.

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THE "Wire Drawing" group reported an average of only 9.52 lost time accident per 1,000,000 man-hours of exposure, which is an exceptionally low accident frequency rate among hazardous industries. This record is excelled by only eight among the thirty-one different industries which reported in 1932 to the National Safety Council. These industries are, in order of the most favorable accident frequency rate: Tobacco, laundry, cement, printing and publishing, machinery, glass, textile, non-ferrous metals. Other industries with accident frequency records more than twice as great are electric railways, laundry, foundry, clay products, refrigeration, meat packing; and lumbering, mining, and construction have accident frequency rates more than four times as great.

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THE Wire Drawing group, however, had a less favorable 1932 accident severity rate (that is the number of days lost as result of disabling injuries per 1,000 man-hours of exposure). Their 1932 accident severity rate was 1.14, as compared with average of .97 for all of the 10 groups among the miscellaneous metal products industries. This high accident severity rate for the Wire Drawing group is due to the fact that there were two fatalities and 23 permanent partial injuries among the 212 disabling injuries which were reported.

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THERE was an extremely wide variation in accident experience among the thirty-five different companies which reported in the Wire Drawing group. These companies were further divided into three sized groups—large units; middle sized units; and small units. The best record among the large units (as previously stated) was by the **Collyer Insulated Wire Co.,** with an average of 275 employees who worked a total of 677,000 man-hours and reported for 1932 only one temporary injury resulting in the loss of only one day of time. The company also has shown splendid progress in accident control during a three-year period, with an accident frequency rate of 14.78 for 1930; 5.84 for 1931; and 1.48 for 1932.

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THE second best record was by a company with an average of 1,759 employees who worked a total of nearly 3,000,000 man-hours and who reported for 1932 only six disabling injuries, but unfortunately one of these resulted in a fatality. This company, regardless of the fatality, has had a very splendid three year accident frequency record as follows: a rate of .66 for 1930; 1.15 for 1931; and 2.05 for 1932.

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THE accident frequency rate of the other ten companies in this size group vary from 2.07 to 23.37. The company with the highest accident frequency rate employed about 500 men who worked nearly 1,000,000 man-hours and reported three permanent partial injuries and nineteen temporary injuries. All of which resulted in a loss of 787 days of time. Incidentally, this company has less than one-third as many accidents per 1,000,000 hours of work in 1931, and less than one-half as many accidents in 1930.

Key No.	Rank	Man-Hours Worked (Thousands)	Total Disabling Injuries	Total Days Lost Time	Rates	
					Frequency	Severity
Rod and Wire Mills						
Total		5,936	73	5,387	12.30	.91
S 46	1	132	0	0	0	0
S 34	2	1,337	3	165	2.25	.12
S 222	3	208	1	1,800	4.80	8.63
S 124	4	341	2	64	5.86	.19
S 61	5	424	3	92	7.01	.19
S 152	6	695	5	113	7.19	.16
S 95	7	700	6	238	8.57	.34
S 24	8	354	4	140	11.29	.40
S 153	9	779	10	940	12.84	1.21
S 29	10	262	5	51	19.05	.19
S 206	11	301	9	318	29.92	1.06
S 6	12	179	7	106	39.14	.59
S 135	13	224	18	1,360	80.18	6.06

FIVE from among the twelve companies which are classified as middle-sized units in the Wire Drawing group, reported perfect 1932 accident frequency records. These companies had from 128 to 275 employees who worked respectively from about one-quarter million man-hours to nearly one-half million man-hours. The remaining seven companies among the middle-sized units had accident frequency rates which varied from 2.89 to 51.09. The company with the accident frequency rate of 51.09, reported an average of 180 men who worked a total of 391,000 hours, with twenty temporary disabling injuries which resulted in a total loss of 366 days.

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FOUR among the eleven small size units of Wire Drawing companies had perfect 1932 accident frequency records. The seven remaining companies had rates which varied from 7.97 to 44.08.

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THE twenty-six wire products companies which reported for 1932 had an average accident experience much less favorable than the Wire Drawing group. The twenty-size Wire Products companies had an average of 4,935 employees who worked a total of 7,927,000 man-hours. They reported a total of three permanent partial disabling injuries and 115 temporary injuries which resulted in a total loss of 4,001 days. This gave them an accident frequency rate of 14.89 (as compared with 9.52 for the wire drawing group). This rate, however, was considerably exceeded by the drop forging group with a rate of 22.54; and structural steel fabricators, 33.09; and boiler shops, 44.85. However, the average accident **severity** rate for the Wire Products group was less than one-half of the average for all of the 10 groups among miscellaneous metal products.

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ONE of the thirteen Wire Products companies which were classified as "large units" made a perfect 1932 accident frequency record. This company had 242 employees who worked a total of 375,000 man-hours. The remaining twelve companies had accident frequency rates varied from 2.46 to 57.89. The company with the highest accident frequency rate had an average of 228 employees who worked a total of about one-half million man-hours and reported thirty-one temporary disabling injuries which resulted in a loss of 422 days of time.

FIVE among the "small units" of the Wire Products group had perfect 1932 no-accident records; and it is interesting to note that three of these companies had perfect 1931 records, and one of these three companies also had a perfect 1930 accident record. The remaining eight companies had 1932 accident frequency rates varying from 9.28 to 27.10.

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ANOTHER comparison of the 1932 accident experience of Rod and Wire Mills is afforded in the "1932 Accidental Injury Rates in the Steel Industry" published by the National Safety Council. This publication summarizes the accident experience of 121 industrial units in the steel industry with an average of 113,343 employees who worked nearly one-quarter billion man-hours. The entire group had an average 1932 accident frequency rate of 10.19, and an average severity rate of 1.81.

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THIS 1932 accident experience for the steel industry was broken down into reports by twenty-six different departments.

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IT is interesting to compare the accident frequency and the ac-

(*Please turn to page 61*)

Disabling Injuries, 1932, Steel Industry, by Departments

Department	Man-Hours Worked (Thousands)	Total Disabling Injuries	Total Days Lost Time	Rates	
				Frequency	Severity
Roll Turning	558	1	52	1.79	.09
General Electrical	5,141	14	8,664	2.72	1.69
Structural and Rail Mills	1,157	5	491	4.32	.42
Tin Plate Mills	19,981	88	13,643	4.40	.68
Galvanizing	738	4	127	5.42	.17
General Mechanical	14,534	99	34,699	6.81	2.39
Coke Plants	6,582	49	21,378	7.44	3.25
Blast Furnaces	4,985	39	7,416	7.82	1.49
Ferro Alloys and Alloy Steel	3,604	29	4,708	8.05	1.31
Blooming and Billet Mills	6,407	54	8,617	8.43	1.34
Transportation	1,802	19	2,490	10.54	1.38
Mason	1,828	21	2,267	11.49	1.24
Pipe Mills	6,283	75	4,146	11.94	.66
Open Hearth	7,308	88	32,711	12.04	4.48
Rod and Wire Mills	5,936	73	5,387	12.30	.91
General Labor	3,626	50	4,065	13.79	1.12
Bessemer	506	7	6,463	13.83	12.77
Bolt and Nut	665	10	300	15.04	.45
Fabricating	3,720	56	7,346	15.05	1.97
Merchant Mills	6,077	96	14,966	15.80	2.46
Skelp and Strip Mills	4,292	69	12,855	16.08	3.00
Sheet Mills	24,904	408	51,632	16.38	2.07
Seamless Tube Mills	4,309	72	10,370	16.71	2.41
Maintenance Foundries	794	17	661	21.41	.83
Plate Mills	1,643	45	1,541	27.39	.94
Forging	182	9	275	49.45	1.51

Card Wire

By Kenneth B. Lewis

Consulting Wire Mill Engineer, Worcester, Mass.

An outline of the history and development of card wire and a short description of present day production methods for this wire.

THE hand card, which is the simplest form in which card clothing appears, might be described as a curry-comb with thickly studded teeth, about two hundred to the square inch. These teeth are of wire in the form of double pointed staples bent to about a 30 degree rake, mounted in a strip of leather or of heavy fabric which in turn is tacked to the "board" of the card. The function of card clothing is to separate, straighten, and lay parallel the textile fibres of which yarn is to be spun. In hand carding, as practised up to about a hundred and fifty years ago, the wool or cotton was laid on one card, the other card was drawn over it a few strokes, and then a reverse stroke against the rake of the teeth cleaned out the fibres and delivered them in a roll, ready for spinning. Today the process is purely mechanical, the card clothing being secured to continuously rotating cylinders.

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History of Card Wire

IT is perhaps unwise to say positively that carding is as old as the other textile processes, for it is entirely possible to spin and weave uncarded fibres, but the earliest references to the textile arts refer to a carding operation. As to the nature of the first cards we can only guess, but it is safe to conclude that wire was used for this purpose rather soon after the invention of the wire drawing die. There is indeed much indirect evidence that wire drawing was pushed along into fine sizes expressly for this purpose. As for direct evidence of its early use we can find it in the town records of Coventry, England, under date of Sept. 14, 1435 in a passage which is interesting enough to be quoted. *"And then he goeth to his card-wire drawer, and saith the same to him and he doth as his master biddeth him. And when the card-maker hath bought this wire thus deceivably wrought he may not know it till it cometh to the crooking. Then it cratcheth and fareth foul; so the cardmaker is right heavy thereof, but nevertheless he seeth because it is cut, he must needs help himself in eschewing his loss, he maketh cards thereof as well as he may. And when the cards have been sold to the Clothmaker and should be occupied, anon the teeth break and fall out, so the clothmaker is foully deceived."* And a little further on is the cardmaker's complaint, a model of brevity. *"Sir, I had of you late, bad wire; Sir, amend your hand, or, in faith, I will no more buy of you".*

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AT about this time, say 1450 or thereabouts, a boy who was destined to write his name in large letters across the pages of American history was in all probability developing the muscles of his forearms with a pair of hand cards. Christopher Columbus' father, it will be recalled, was a woolcarder in Genoa. An apprentice-ship to such a trade was well calculated to make an active boy wonder whether the hardships of a sailor's life might not have been greatly exaggerated.

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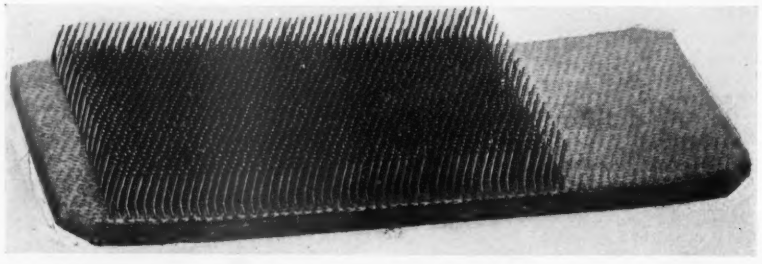
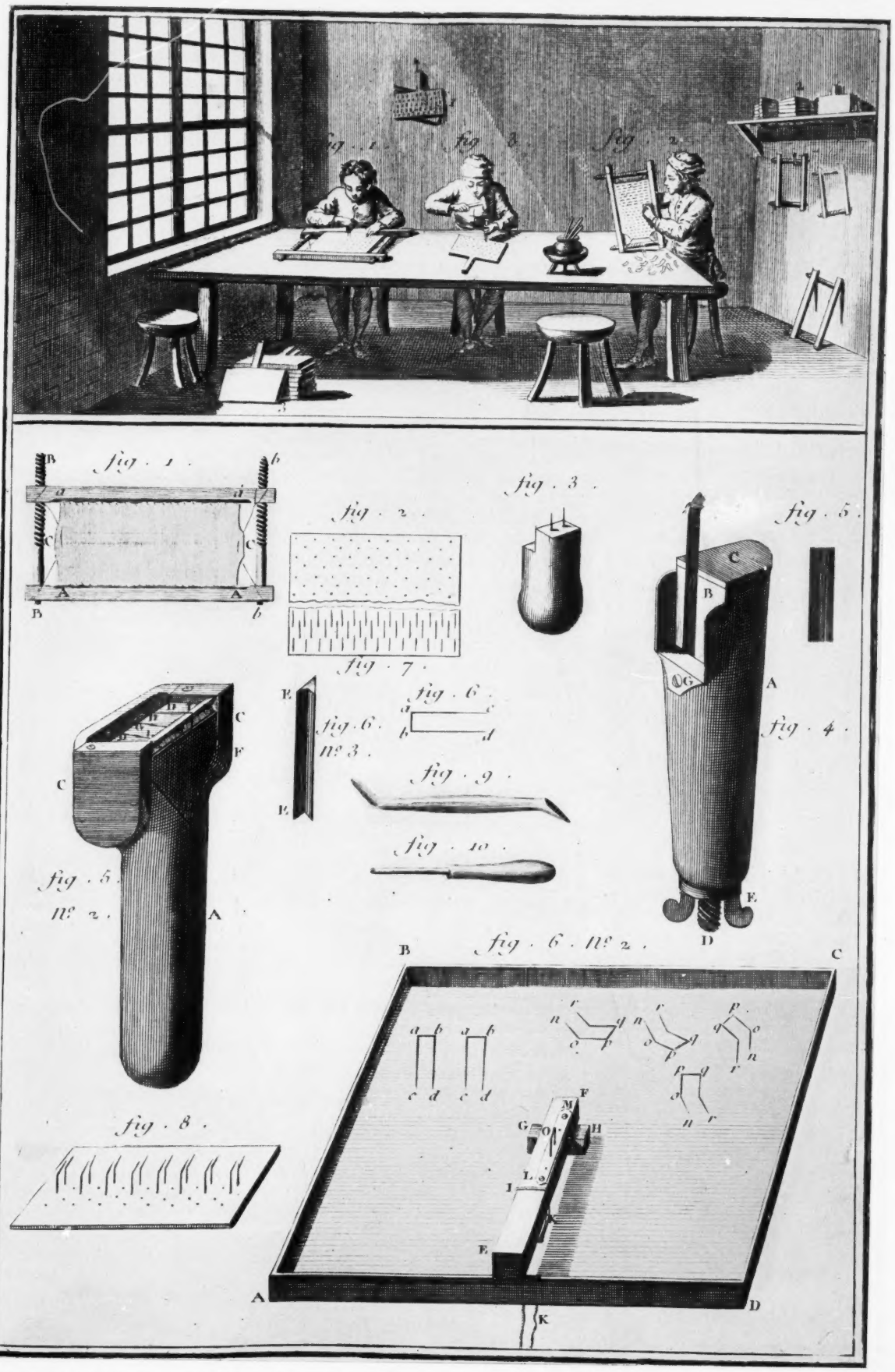
THERE is, in fact, no lack of reference to card wire throughout history, particularly English history. England struggled three hundred years or more to get her textile industry established and to shift her position from that of a pastoral to that of an industrial people. English wool went abroad and was brought back as cloth; at a later stage English iron and English leather went abroad and were brought back as cards, and the industrial leaders were, as the Conventry records would put it, "right heavy thereof". Under date of 1598 we find Elizabeth considering a petition to place an embargo on French cards. Of the English makers the petition states *"They are able not only to serve this whole Realme of England and Wales with Iron wyer sufficient and at as reasonable prices as*



Card Wire. ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦



Carding and Card Wire—From an old print.

forren wyer can be afforded for all necessary uses thereof but also with an overplus to be vented into other countries. . . . . The iron Wyer cards that are usually broughte over are for the moste parte made in Roane in Normandy, a leaguer towne in Fraunce and both the Skinnes and Bourds thereof they are made are caryed out of this Realme whereby your Majestie's Enemyes be sett on woorke and growe riche whilest your Majestie's good Subjects become idle and are ready to begge for lacke of occupacon."

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ELIZABETH appears to have disregarded the appeal but Charles the First had a better business head. He announced in 1630 that iron wire had long been manufactured in his Kingdom, and its production gave employment to many thousand people; this wire, he said, was made of the best and purest iron, also a home product, and that it was unsurpassed by foreign wire, especially for cards, without which it was impossible to make good cloth. As he found the wire mills suffering from severe competition from abroad, he expressly forbade the importation not only of wire but of cards, and several other named wire products.

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THE accompanying illustration is from the Encyclopedie Methodique and shows card making in about 1760. One man is pricking the leather, one is putting in the staples, and one is tacking the leather to the board. The tools are clearly shown, a clamping gauge for measuring and cutting off the wires, bending jig for staples, crooking jig, and dressing tool whose duplicate can be found in any card clothing shop today. The double pointed prick punch is well shown.

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Mechanical Development

MECHANIZATION has preceeded along two lines. The "carding engine" fought its way into English practise beginning about 1760, and perhaps sixty years later, in easy stages, the machine which cut, bent, crooked, and mounted the wire staples in the "foundation." The carding engine consisted chiefly of one large and several smaller cylinders covered with card clothing and so driven as to simulate the action of hand cards in laying the fibres straight. One cylinder, the "doffer", had its tooth rake reversed, and peeled out the fibres in a thin web called a "top" which could be spun into a single yarn. Changes have been chiefly refinements. The working cylinder has grown from 16 to about 60 inches in diameter. The clothing must be tightly stretched on the cylinders and is nearly always applied as a long narrow strip, 1½ to 6 inches wide, spiralled around the iron cylinder and tacked to wooden inserts. The width of the strip is varied roughly with the cylinder diameter so that the spiral pitch of the tooth lines will coincide within reasonable limits.

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MACHINERY for making and setting staples has been of later and of slower development. For many years after the wire was mechanically measured, cut, bent and crooked, the staples were put in by hand, generally as a home industry. Messrs. Earle and Chase who had a store in Worcester, Mass., advertised in 1826 that "persons who wish for cards to be set can be accommodated at our store." A good setter could put in about twenty thousand teeth in a day. Machines of today put in about six hundred staples, (1200 teeth) per minute, about 600,000 teeth per shift, working from the coil of wire. While this sounds like a lot of material it must be stated that the average card runs about 50,000 teeth per square foot, so a day's work for a machine is not much card clothing. The machines naturally are small and numerous, and one operator has many of them in charge.

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ORIGINALLY of wrought iron, the teeth are now of tempered steel. Tempered steel crept in from England, and as much as fifty years ago it was freely predicted that it would drive out iron. The "foundation" as it is called, originally leather, is now made of various materials, textiles predominating. Cotton, linen, or a combination of these and other fabrics, are used, their plies cemented or vulcanized together to a thickness of ⅛ to¼ inch. Rubber faced and metal faced foundations have their uses. A certain degree of resilience is wanted, and it, together with other desired characteristics, is secured by varying the nature and thickness of the foundation as well as the gauge, length, setting angle and rake of the teeth. Tinned wire is used for some purposes, as also is brass wire. The teeth are pointed, this job being done after the clothing is on the cylinder, by rotating the cylinder against an abrasive wheel. It is said that failures of teeth are much more apt to occur during this operation than during normal use. Teeth are re-sharpened repeatedly before the clothing is discarded.

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The Wire

GETTING down now to the wire itself, this is required in many sizes, ranging chiefly from about .020 to .008, with the heavy demand from .012 to .010. The stock is open hearth steel, .55 to .60 carbon. Rods patented at No. 5 are drawn to about .145, repatented, and drawn to about .070, repatented and taken to about .035. This is dry drawing with lime coat and soap. At .035 the wire is again patented, coppered and drawn wet to its final gauge, whatever that may be. Tempering is of course a continuous operation, the wire passing through hot lead, plunging into oil, and then into lead at suitable heat to draw back the temper to the desired point. The operation is "bright" tempering, arrangements being such that after entering the lead kettle the wire is not exposed until it comes out of the tempering kettle with a steel gray color and luster. Before the advent of the pyrometer one

(*Please turn to page 60*)

Seams for Fourdrinier Wires

Part II

By Kürt Jahn, Sallfeld, Thrg. Germany

A description of the methods in use in Germany for obtaining an endless wire belt for fourdrinier paper making machines. The article particularly describes methods of producing various kinds of seams for joining the belt. (Continued from January)

Special Seam No. 10

THE last weft wires are taken out of the cloth, and the free ends of the warp wires are interlaced into the other sieve part, where they are joined in pairs by intertwining or twisting them together to a knot. At this special seam no closing wire is used, but the intertwisted warp wires of one end of the cloth embrace directly the weft wires of the other end of the belt. However, this seam offers the disadvantage that the meshes condensed by the knots of the interlaced warp wires are easily stopped or obstructed.

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Special Seam No. 11

THIS seam is made by arranging the free ends of the warp wires in specially prepared canals, thereby joining the two separate ends of the belt. In one method of this seam, the free ends of the warp wires are led back and spliced into mesh openings lying in the same sieve part from which the warp wires are projecting. So, loops are formed at both ends of the cloth which are joined by means of a closing wire. This seam evidently is made in a twisting or braiding process for which the warp wires have to project considerably. Besides, canals have to be provided in the cloth during the weaving process into which the free ends of the warp wires are interlaced. These proceedings allow us to join two sieve parts only at the places already predetermined at the weaving of the cloth. Any change of the fourdrinier wire length is impossible.

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Special Seams see photos 12 and 13

THESE photos represent the seams now in most frequent use. The last weft wire of both cloth ends is well fastened with its warp wires by soldering or welding. A closing wire embraces the fixed weft wires of both ends of the belt and joins them. This welded seam is easy to make, secures a long life of the seam, does not mark the paper and does not prejudice the drainage at the seam. Photo 12 illustrates this special seam at plain cloth, photo 13 at twisted (cabled) cloth.

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Special Seams see photo 14

THE soft soldering generally used at the welded seams often is not sufficient to fasten the last weft wire of each cloth end with its warp wires in a really positive and reliable manner. Also the mechanical or electrical welding of the wire meshes of the last weft wire with the warp wires often is not advantageous, as on the one hand specially alloyed wires have to be used and on the other hand the cross section of the wires is reduced in a critical measure by the welding process.

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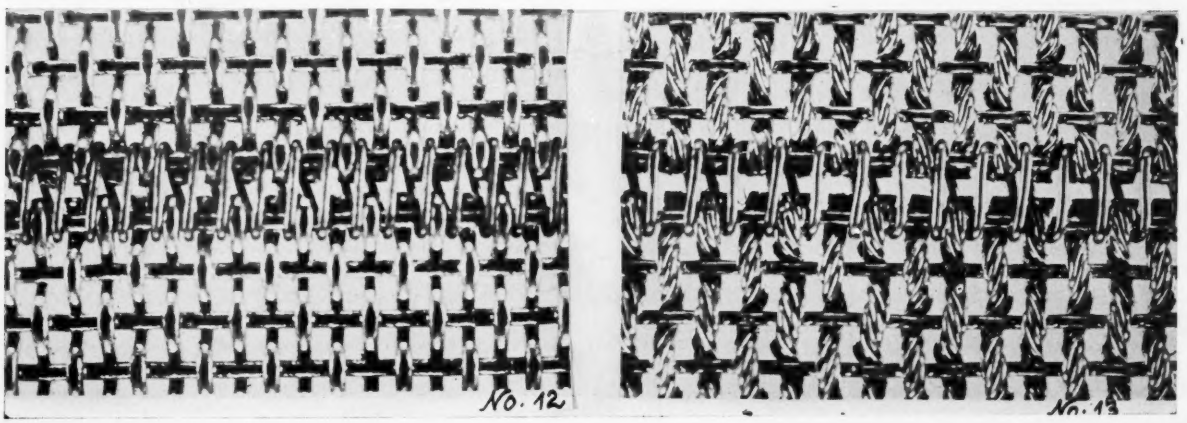
THESE drawbacks are avoided by the special seam according to photo 14, at which the last weft wire of both adjacent cloth ends are welded with its warp wires



by means of **hard soldering.** The join of the so fixed last weft wires of the opposed cloth ends is made by a closing wire. In this way an absolutely reliable joining of the last weft wires with the ends of the warp wires is guaranteed so that the closing wire for joining the two sieve parts need only to be wound round this last weft wire of the adjacent sieve parts. A special preparation of the cloth by the use of alloyed wires is not necessitated at this special seam, and the strength and resistance of the seam is not affected by diminution of the wire cross section.

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IN a view seen from above, photo 14 illustrates a seam of an endless belt made in the above mentioned method. The weft wires are designated in general with b and the warp wires with "a". To join the last weft wires "b 1" resp. "b 2" of each cloth end without diminishing the cross section of the wire and in a really reliable way with the ends of the warp wires "a", these two last weft wires b 1 resp. b 2 are soldered up with their warp wires "a" by means of **hard soldering.** Thereby, a very reliable and durable joint is obtained, and the fixed two last weft wires b 1, b 2 of each sieve part can be joined together directly by a closing wire c. This closing wire c overlaps at no place of the cloth more than one mesh opening and, therefore, fits so flat into the joining places of both sieve parts that it does not noticeably mark the paper formed over the fourdrinier wire.

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Method of Making a Welded Seam for Fourdrinier Wires

Special Seam, See Photo 15

SEAMS for fourdrinier wires must not only be mechanically solid, resistant and also flexible, but they must run over the rollers of the paper machine in the same smooth way as the chief part of the cloth. Furthermore, the draining is not permitted to be essentially different at the seam from the other part of the cloth, in order to avoid a too strong marking of the paper by the seam. Most of the seams, which are in common use, do not fulfil these conditions in full measure. The most usual seams with a closing wire passing behind weft wires specially fastened with their warp wires, are mechanically sufficiently solid and also flexible, but the closing wire inevitably projects over the surface of the cloth and condenses the mesh openings. At seams of other kinds, the metal used for making the seam often gives trouble in a similar way. It has been tried to join the ends of the warp wires of both sieve parts with one another by welding, but in most cases these trials did not succeed in joining the warp wires in a sufficiently positive and reliable way.

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THE device described in the following makes this possible in a satisfactory manner. By means of this device, the two ends of the fourdrinier wire are brought into a suitable angle-position to one another before the welding process. With exception of the warp wire ends to be joined, the two sieve parts are held fast between a rooflike frame and covering plates in such a manner that only the warp wire ends are exposed to the flame of the welding burner or the like. This arrangement not only makes it possible to bring the warp wires into exactly the right position for the welding and to keep them in this position during the welding process, but all parts not to be welded are protected against the influence of the welding heat.

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THE device is illustrated in a schemed drawing in photo 15. Figure 1 shows a side-view of the total device. Figure 2 illustrates on a larger scale the uppermost part of this device. Figure 3 is a view from above upon a seam (largely magnified) made by this method.

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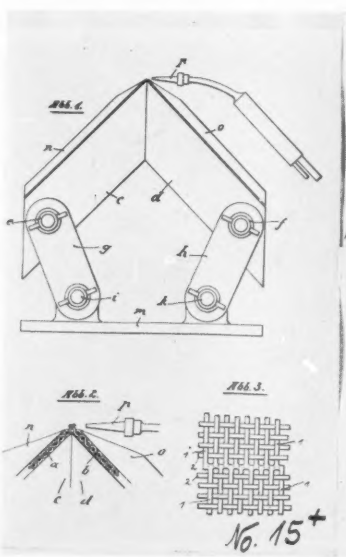
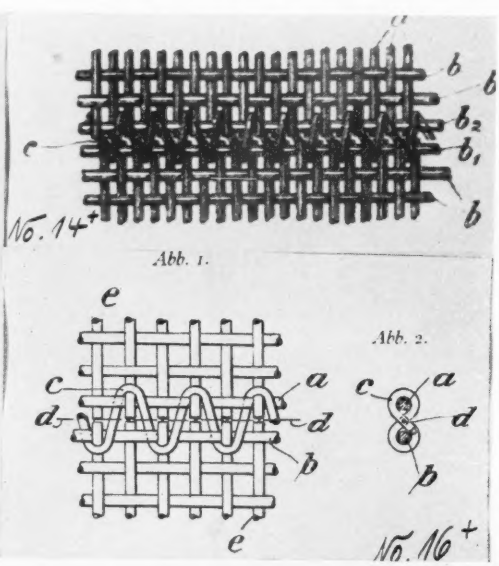
BEFORE making the seam, the two sieve parts "a" and "b" of the fourdrinier wire are put on a rooflike frame consisting of two parts c and d which can be fixed in links g and h by means of screws e and f. These links g and h in return can be fixed on eyes of a base plate m by means of screws i and k. Thus being adjustable, the device enables the choice of the right and most favorable angle for making the seam. Metal plates n and o serve for holding fast the sieve parts "a" and b on the rest plates c and d. The ends of both sieve parts are pushed forward so far that the projecting warp wire ends (if necessary the last weft wire of each sieve part has to be drawn





out of the cloth) are overlapping and crossing one another as shown in figure 2. The covering plates n and o are so arranged that the total sieve parts are covered with exception of the projecting warp wire ends. The darting flame of the welding burner "p" causes these warp wire ends to be melted down, till a firm joint of the ends with one another results.

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THIS gives a seam as illustrated in photo 15, figure 3. The warp wires are designated with 1, the weft wires with 2. Only the warp wire ends of both sieve parts are here welded together. The traverse joint of the warp wires made by the welding process has approximately the position, the thickness and the effect of one of the weft wires so that the fourdrinier wire works at the seam in nearly the same way as at all other places as well as in its mechanical properties and its effect upon the paper pulp.

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THE welding can be done by means of darting flames extended over the whole width of the fourdrinier wire or in a simpler way by guiding slowly one or more welding burners over the whole width of the seam from one side to the other. But it is not absolutely necessary to effect the welding by means of a darting flame; any other welding methods can be applied, e. g. electrical welding, etc.

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Special Seam See Photo 16

THIS special seam solves in a favourable way the problem to secure for the paper pulp running on the fourdrinier wire in the paper machine a free passage of its secreting water (back water) through the meshes of the cloth especially at the seam, as otherwise the water remains in most cases somewhat higher at a corresponding place on the paper, causing the paper to have a bad look, to be ruffled or even to break off on account of the prevented draining and the insufficient drying at this place.

AT the other seams, the ends of the fourdrinier wire are joined by soldering, welding or melting up the two adjacent cloth ends. The warp wires of each sieve part are thereat welded or soldered up with the last weft wires, and then the join is made by a closing wire. This closing wire runs in a spiral line through the meshes of both sieve parts forming on both sides of the cloth flat, oblique windings lying closely together at the seam-joint and causing congestion of the seam and preventing the draining and marking of the paper. There also arises the further disadvantage that the warp wires on the underside of the fourdrinier cloth engrave somewhat into the covers of the suction boxes, i.e. into the metal or wood rails over which the fourdrinier wire has to slide. This means an injurious reaction of the remaining wood pieces to the closing wire, if these rails are not regularly and carefully squared. The closing wire suffers an additional wear by a spoon-like grinding easily causing a breaking of the closing wire and a premature uselessness of the endless belt.

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TO avoid these disadvantages and to reduce the marking of the closing wire in the paper, it is necessary to form the seam on the upper side of the endless belt in such a way that it appears on the surface only superficially just like the cloth itself, thus marking the paper not more than the cloth itself does it. At the special seam according to photo 16, the last weft wires "a" and b of each sieve part are joined with their warp wires e (figure 1) by soldering, melting or welding like at other seams. However, the closing wire is not wound through the meshes of the cloth **in a spiral line,** but **by slingwise guidance** of the closing wire—and this is the essential note of this special seam—it forms loops alternately at the crossing points of the last weft wires "a" and b with the warp wires e on both sieve parts.

FIGURE 1 illustrates how the closing wire c winds at first under the weft wire b at the one sieve part and then over the first warp wire e at its crossing point with the weft wire b, then forming in the same way a sling at the crossing point of the second warp wire e with the last weft wire "a" at the opposed sieve part. This proceeding repeats at the first sieve part at the crossing point of the third warp wire e with the last weft wire b, then at the fourth warp wire at the opposed end of the belt, etc. in such a way that both ends are joined **by a slingwise guidance of the closing wire alternately embracing the crossing points of the last weft wires with their warp wires.**

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AS figure 2 shows, the curve formed by the closing wire c —seen from the side—has the form of a sling, the turning-point d of which creates an articulated seam of the endless belt. This articulated joint is of great importance for endless fourdrinier wires since they must permanently run round pressing and guiding rollers having partially a diameter of not more than 6 inches. Therefore, fourdrinier wires with this articulated joint can better conform to the small circumference of the rollers than if the closing wire runs in a spiral line over the penultimate weft wires of both ends of the belt. Figure 2 illustrates also that the closing wire c at its slings gives only a puncti-form marking of the paper just like the cloth itself, and that this closing wire does not prejudice or prevent the draining of the paper pulp at the seam of the fourdrinier wire.

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Special Seam See Photo 17

THIS special seam has the characteristic that the last weft wire of each cloth end melted, or soldered up with its warp wires is **reduced** partly; that is, up to the half of its cross-section and that the two reduced weft wires are then joined to **one** single

weft wire by melting, soldering or welding. At this seam, therefore, no closing wire is used contrary to most of the other seams. The inconvenience experienced with the other seams is here avoided, especially the stoppage of the meshes and the undesirable water-permeability as well as the premature uselessness of the fourdrinier wire caused by the breaking of the closing wire as the result of friction or wear. All these drawbacks are prevented without weakening the fourdrinier wire at the seam.

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AS already mentioned, at this special seam each of the two sieve parts to be joined are fastened by melting, welding or soldering up the last weft wire "a" with the warp wires b, c. These last weft wires "a" so fixed with their warp wires b, c are shown in photo 17, figure 1 and 2. These welded side-seams are absolutely necessary as practice has proved that at non-fixed cloth ends directly welded together, the warp wires do not precisely oppose one another but are displaced from each other so that a welding or soldering of the warp wire ends of both sieve parts then is not possible. A joint of the two cloth ends illustrated in figures 1 and 2 is made in such a way that the last weft wires are reduced partially, up to the half of their cross-section (figures 3 and 4). Also the warp wires b, c welded up with the last weft wire "a" are reduced in the same way. These operations are generally mechanical. In spite of the shortening of the cloth ends and in spite of the reduction of the cross-section of the last weft wires, the firm connection (by melting, soldering or welding) between warp wires and the last weft wire endures. The last weft wire "a" of each cloth end so prepared and reduced in the cross-section are then put together and joined to **one** weft wire "a" by melting, soldering or welding, and at the same time the shortened warp wires of both cloth ends are joined together by the united last weft wire. The seam made by this method is illustrated in figure 5.

GENERALLY it is advisable to reduce the cross-section of the last weft wire "a" of each cloth end up to its half. But a smaller or larger reduction is possible and would then give in the junction a longish-round or oval cross-section of the combined last weft wires.

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THE joint of the cloth obtained by this method can be designated as perfectly seamless. It offers the advantages that the joint place is not weakened, and that the meshes beside the joint place are in no way stopped or thickened, since this joint is made in a certain measure in a rather mathematic seam-line, which is observed with the eye only as a somewhat dark stroke and which in the use can be in no way prejudicial.

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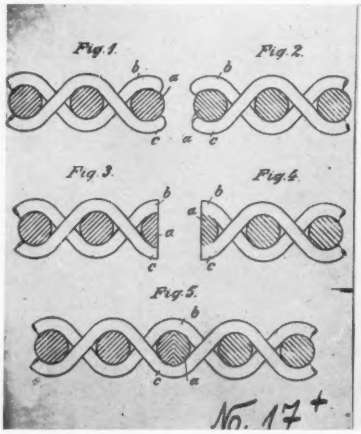
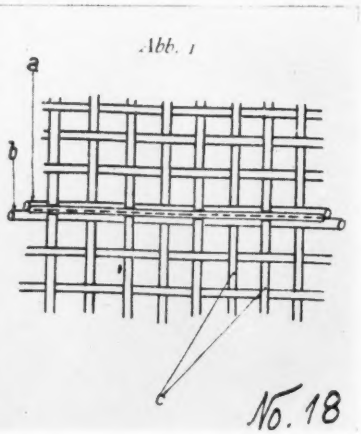
Special Seam, See Photo 18

AT this seam, the warp wire ends standing out of the last weft wire are cut off at both cloth ends, and these last weft wires of both adjacent sieve parts are then joined by welding or soldering. Photo 18 illustrates such a welded seam. The two last weft wires are designated with "a" and b, the warp wires with c. An advantage of this special seam is that the mesh openings at the joint-place are not stopped or thickened by closing or stitching forming wires. However, the seam itself, though only as wide as two weft wires, is water-impermeable.





Part III of this article will be published in the March issue of Wire and Wire Products

Heating Strip for Razor Blades

IF razor blades are to painlessly remove whiskers the tempering and heat treating must be done with great exactness. Inductive heating of the strip material can do just this and is being used in the plant of one large manufacturer. However to be sufficiently fast, the job calls for a frequency of 4800 cycles and to generate this was the problem. The usual type of synchronous generator for this frequency would require 160 poles and a speed of 3600 rpm.—Certainly a most difficult job. The solution came by using a water cooled inductor type generator. There are still effective 160 poles but no winding is required on the rotating part. The field winding is a stationary coil, concentric with the shaft. Magnetic flux jumps a small air gap to the mass of the rotor iron—flows out through narrow solid pole pieces on the periphery creating an alternating voltage in the stator winding.

The machine, rated 60 kw., is totally enclosed and is cooled by water pipes placed to cool the stator iron and the air enclosed in the machine.

Exports and Imports of Wire

Exports of iron and steel wire products in Nov., 1933 and Nov., 1932
(In gross tons)

	Nov. 1933	Oct. 1933	Nov. 1932
Wire rods	2,062	2,645	472
Hoops, bands and strip steel	1,974	1,424	1,276
Plain black or galvanized iron or steel wire	2,870	3,420	404
Barbed wire and woven wire fencing	3,173	2,661	904
Woven wire screen cloth	36	74	51
Wire rope	372	258	107
Insulated iron or steel wire and cable—see analysis below			
Other wire and manufactures	253	357	167
Wire nails	984	832	711
Tacks	58	25	30
Other nails, including staples	185	270	170
Bolts, machine screws, nuts, rivets and washers	357	560	206
Total, these 11 classifications	12,324	12,526	4,498

Imports of iron and steel wire and wire products into the United States
(In gross tons)

Concrete reinforcement bars	479	85	1,474
Hollow bars and drill steel	118	71	103
Merchant steel bars	2,026	2,178	3,150
Wire rods	778	1,735	935
Barbed wire	389	311	1,876
Round iron and steel wire	458	261	102
Telephone and telegraph wire			2
Flat wire and strip steel	150	210	131
Wire rope and strand	163	103	148
Other wire	125	77	243
Hoops and bands	1,682	2,351	2,741
Nails, tacks and staples	651	696	1,199
Bolts, nuts and rivets	26	41	33
Total, these 13 classifications	7,045	8,119	12,137

Exports of Insulated Wire and Cable

NOVEMBER, 1933

	Lbs.	Value
Insulated iron or steel wire and cable	993	$ 184
Rubber covered wire	157,195	36,565
Insulated copper weatherproof wire	60,351	9,109
Wire and cable telephone cable	1,949	512
Other insulated copper wire	411,395	75,493
Nickel-Chrome Electric	13,352	19,523
Total, these 6 classifications	645,235	$141,386

EXPORTS in November were smaller than those of October by 7,155 tons. The largest single decrease was in galvanized steel sheets (6,051 tons), but there were also sharp declines in welded and seamless casing and oil line pipe (1,910 tons and 1,897 tons). Partially offsetting these were gains of 4,427 tons in the trade in scrap, of 968 tons in the shipments of car wheels and axles, of 955 tons in skelp, and of 933 tons in black steel sheets.

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JAPAN continued as the United States' leading market for iron and steel products, taking in November 59,115 tons, of which 53,789 tons was scrap, 3,012 tons was tin plate, and 974 tons was car wheel and axles. Of the Canadian total of 24,396 tons, 12,501 tons was scrap and 4,724 tons was tin plate, while 17,747 tons of the Italian total of 18,323 tons was scrap. Brazil purchased 11,718 tons in November with heavy rails (5,827 tons), rail joints (2,146 tons), and barbed wire (1,120 tons) the principal items—the Argentine trade of 6,044 tons included 935 tons of plain wire.

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IMPORTS of iron and steel in November dropped to 28,979 gross tons—17,694 tons under the October figure. Pig iron was the principal contributor to this showing, receipts of this commodity being only 4,079 tons or 15,543 tons less than in the month before. Other products to show sharp reductions were scrap (4,464 tons), structural shapes (1,317 tons), and wire rods (957 tons). Of the fourteen increases registered but one was in any considerable amount that being the 4,361 ton increase in the receipts of ferro-manganese.

CANADA, slightly increasing her total tonnage (to 13,264 tons), remained the leading supplier of iron and steel products to the United States—her total being featured by 9,003 tons of ferro-manganese and 2,851 tons of scrap. Belgium, with a more varied trade, was second—her total of 5,590 tons including 1,671 tons of merchant steel bars, and 989 tons of hoops. All of India's 3,447 tons was pig iron, while of the German total of 2,434 tons, 624 tons were nails, and 346 tons were barbed wire. The fifth source—Sweden—supplied 1,500 tons including 630 tons of wire rods and 199 tons of merchant steel bars.

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CARD clothing receipts were much reduced—the total of 23,013 square feet ($32,286) including 20,418 square feet ($28,226) from the United Kingdom and 2,595 square feet ($4,060) from Germany.

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STILL another reduction was that in wire cloth and screening—to 30,917 square feet—the principal sources of supply being Canada (21,360 square feet), Germany (4,613 square feet), Sweden (2,210 square feet), France (1,714 square feet), and Czechoslovakia (1,020 square feet).

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FOURDRINIER wire imports were down to 42,611 square feet with 24,310 square feet originating in Austria, 7,267 square feet in Sweden, 6,781 square feet in Germany, and 4,253 square feet in France.

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THE trade in wire fencing and netting was much smaller in November. The 1,004,195 square feet of this product galvanized before weaving all came from Germany while the 463,330 square feet of fencing, and netting galvanized after weaving was divided between Germany (278,680 square feet) and the Netherlands (184,650 square feet).

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EXPORTS of iron and steel wood screws during November totaled 30,538 gross, valued at $8,653. The principal purchasers were the United Kingdon with 12,880, Mexico, 9,022, Italy, 1,950, and Guatemala, 1,665 gross.

'Round the World With the Wire Industry

Great Britain Increases Duty on Rolling Mill Rolls

ON the recommendation of the Import Duties Advisory Committee (British) the Treasury announced on Aug. 30, 1933, that the duty on the following classes of rolls, either forged or cast, for rolling mills, would be changed: (1) Value not exceeding 24 lb. per ton (formerly 20 percent) now 33.33 percent; (2) Value between 24 lbs. and 40 lbs. per ton (formerly 20 percent) now either 8 lb. per ton, or 20 percent, whichever is greater; and (3) Value exceeding 40 lbs. per ton (formerly 20 percent) now 25 percent. These new duties were put into effect as of Sept. 5, 1933.

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AT the time these changes were announced, the Advisory Committee stated that "These (rolls) have hitherto been subject to a duty of 20 percent ad valorem as parts of machinery. They now become dutiable at the same rates as other forgings and castings, in order to protect the home manufacturer against the uneconomic price cutting to which these goods, like other similar iron and steed products, are being subjected by foreign competition. The new duties, in common with other additional duties on similar iron and steel products, cease to be chargeable on the expiration of 2½ years from April 26, 1932".

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British Apply for Increased Aluminum Wire Duties

THE British Import Duties Advisory Committee has given notice of the following applications:

For an increase in the import duty on:—rods, wire, tubes, and sections of aluminum or alloys of aluminum containing more than 50 per cent by weight of aluminum.

Any representations which interested parties may desire to make in regard to these applications should be addressed to the Import Duties Advisory Committee, Caxton House, Tothill Street, London, S. W.

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Vickers Works Being Reorganized

IT is reported that the Vickers Works, Sheffield, England, of the English Steel Corp. is to be reorganized and brought up to date and that this will involve an expenditure of approximately £500,000.

Provisions are being made for the installation of one additional open hearth furnace in the new steel melting house, making a complete battery of four 60-ton furnaces. It is understood that the bulk of the expenditure is to be made in the extension of the plant for the heat treating of special steels.

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Spowers Retained by Lancashire Wire Co., Ltd.

THE Lancashire Wire Co. Ltd., of Manchester, England, has retained W. H. Spowers, Jr., Consulting Galvanizing Engineer, of New York, N. Y., to advise them in all problems connected with their galvanizing operations.

✦ ✦ ✦

Syndicate of German Rivet Manufacturers for Domestic Market

THE cut-throat competition among the German rivet manufacturers, which had continued for many years, was recently checked in accordance with the new Government's economic program. First of all, manufacturers of raw materials are no longer permitted to quote preferential prices to concerns subsidiary to or affiliated with them, but the latter have been placed on an equal basis with the independent rivet manufacturers. A price convention has been organized which has thus far been joined by 45 manufacturers. This measure is said to have lead to an appreciable stabilization of prices, despite the fact that quite a large number of firms have not yet joined the new convention.

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THE present basic price, Dec. 1932, for rivets is RM. 185.00 per ton, freight basis Oberhausen. The surcharges hitherto in force, remained unchanged in general. A maximum rebate of 55 percent on the basic price is granted for standard trade rivets, the quotations being dependent upon the amounts purchased. However, it is not planned for the time being to organize a sales syndicate with a quota system while it remains to be seen how and to what extent the demand for curtailed production can be complied with.

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New Mill in Australia

THE Australian Steel Co., Ltd., of Sydney, N. S. W. Australia, are starting construction on a new steel mill to cost approximately $500,000 including equipment.

The bulk of the machinery is to be purchased in the United States and D. L. Benbow of New Philadelphia, Ohio, will supervise the erection and installation of the plant and equipment.

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International Wire Cartel Meets in Brussels

MEETING in Brussels on November 8th the International Wire Cartel (which includes Belgium, France, the Netherlands, Germany, Czechoslovakia, Hungary and Denmark) agreed upon certain price reductions. While no statement is at hand as to the general applicability of these reductions it should be noted that in the case of Belgium the price of spikes was reduced to 150 Frs.

from 155, that of bright wire to 110 Frs. from 130, and that of No. 12 barbed wire to 170 Frs. from 190.

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THE International Wire Cartel, formed for a period of 5 years, began operations on January 1, 1932. Up to the present time it is reported to have given complete satisfaction to its membership as well as to the Fence Wire Cartel (which includes Austria and the Saare). Participation quotas are calculated on a basis of approximately 700,000 tons annually—the largest proportion being alloted to Belgium and Germany. The cartel holds the export sales monopoly for bright, annealed, coppered and varnished, tinned and barbed wire, springs, and three-fold hexagonal fence wire.

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German November Exports

THE German wire cartel reports that export business during November was 16% greater than October and that this improvement has been maintained through the month of December, although the domestic demand showed the usual seasonal decline.

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Independents Increase Rod Capacity

THE chief outsider of the International wire rod cartel and the IWECO, the Societe Franco-belge d'Avers has increased its wire rod capacity to 3000 tons monthly and its wire nail capacity to 1500 tons monthly and is competing keenly against the two syndicates.

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IT is reported that this company has definitely decided to stay out of the cartel and that negotiations with the Swedish Wire Nail manufacturers also resulted in a decision on their part not to join the cartel.

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THE French War Ministry has placed huge orders for barbed wire. In October 720 tons were bought; in November 500 tons, and in December over 600 tons. This wire is 6 cm apart and of 2.8 mm diameter for each of the two strands.

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Hexagonal Wire Netting

THE German wire netting export market reveals a substitution of hexagonal wire netting made of galvanized wire in place of hexagonal wire netting galvanized after drawing. It is estimated that nearly 40% of the total exports were of this character during 1933 while in 1930 only 10% were of this character and in 1927 only 5%.

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IT is reported in the export markets that the hexagonal netting is finding a stronger competitor in square netting, particularly for chain link fencing, despite the high freight rates on the hexagonal netting. In many export countries such as the Near East, Egypt, South Africa and Latin America, square netting is more and more replacing the hexagonal netting.

✦ ✦ ✦

Japanese Wire Nails Boycotted

GERMAN exporters report that the Chinese and other importers in the Straits Settlements, Burma and Siam are boycotting Japanese wire nails due to the fact that they purchased on a net cash basis from the Japanese but when claims were put in for defective products the Japanese producers paid no attention to them and the purchasers found themselves loaded up with poor and unsaleable products.

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AS a result the importers of these countries decided that either Japan must agree to sell on the same terms as the European shippers or they would not buy any further from the Japanese.

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EUROPEAN terms usually offered are 60 to 90 days documents against acceptance while the Japanese terms are net cash against documents subject to a cash discount of 5%.

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German Fine Wire Cloth Sales

THE German mills producing extra fine wire mesh and cloth for the mining industry, and more particularly the gold mining industry, are very busy and most manufacturers are operating at about 90% of capacity.

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CANADA is buying but most of the orders are coming from Australia, South Africa, Latin America and Central America. Most of the wire mesh now produced in Germany for the gold mines is made of monel metal, Lautalmesh (Lautal is an aluminum alloy), cupro-nickel mesh; the latter being used for the very finest diameters.

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Cupalloy

THE ancients discovered a so-called method of hardening copper, the secret of which is said to be lost. In recent times similar methods have frequently been rediscovered but all of them, both ancient and modern, involve the use of alloying elements which have reduced the electrical and thermal conductivity.

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FOR use in commutators, slip rings and other electrical devices a hard metal is necessary and high conductivity of heat and electricity very desirable. A new group of copper base alloys, called Cupalloy, much harder than pure copper, with much higher elastic strength and whose electrical conductivity approaches that of pure copper have been developed. The creep strength of this alloy is considerably greater than that of cold drawn copper and the strength does not deteriorate with time at elevated temperatures as is the case with cold drawn copper.

A Review of Recent Wire Patents

No. 1,927,498, BELT FOR FOURDRINIER MACHINES. Patented September 19, 1933, by Hamilton Lindsay, Shaker Heights, Ohio, and Edward J. Buell, Niagara Falls, N. Y., assignors to The Lindsay Wire Weaving Company, Cleveland, Ohio, a Corporation of Ohio.

This wire fabric belt embodies a construction wherein the warp wires and weft wires have such relation to each other in size that the plane of the tops of the weft knuckles is disposed above the plane of the center of the warp knuckles and below the plane of the tops of the warp knuckles, whereby a sheet formed thereon possesses substantially the same degree of smoothness on each side.

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No. 1,928,575, HIGH TENSION CABLE. Patented September 26, 1933, by Ernst Gustav Sievert, Stockholm, and Bernhard Sophus Faith Ell, Spanga, Sweden, assignors to Telefonaktiebolaget L. M. Ericsson, Stockholm, Sweden, a Company of Sweden.

The lead sheath of the cable is tightly enclosed along its entire length by a non-elastic cover of concrete. It is claimed that deformation of the lead sheath under influence of the inner over-pressure is thus prevented.

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No. 1,936,679, WIRE STRAIGHTENING MECHANISM, Patented November 21, 1933, by Jacob T. Leech, Beaver Falls, Pa.

A rolling contact is provided instead of the conventional friction shoes, the rollers being arranged to permit the wire to be bent sharply when required.

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No. 1,936,931, MACHINE FOR MAKING WIRE FABRIC, Patented November 28, 1933, by Albert Bradley, Sterling, Ill., assignor to Northwestern Barb Wire Company, Sterling, Ill., a corporation of Illinois.

The machine is specificially adapted for the making of wire fabric of herring bone design, a guiding sleeve being provided so that the fabric will be wound on the receiving reel evenly.

✦ ✦ ✦

No. 1,936,940, NAIL STRIP FEEDER, Patented November 28, 1933, by William H. Johnson, Arlington, Mass., assignor to United Shoe Machinery Corporation, Paterson, N. J., a corporation of New Jersey.

In this apparatus, a support for a reserve roll of nail strip is provided in combination with a tension spring constructed and arranged to advance the free end portion of the wire nail strip to a feeding machine.

✦ ✦ ✦

No. 1,936,994, RUBBER INSULATED ELECTRICAL CONDUCTOR, Patented November 28, 1933, by Harold D. Rice, Bristol, R. I., assignor to National India Rubber Company, Bristol, R. I., a Corporation of Rhode Island.

The inventor has endeavored to provide a grainless texture conductor which will be dielectric when wet. The rubber insulation contains not more than five

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per cent of natural non-rubber constituents.

✦ ✦ ✦

No. 1,937,054, OIL-FILLED CABLE, Patented November 28, 1933, by Carl Cremer, Copenick-Wendenschloss, near Berlin, and Max Weiset, Templehof, near Berlin, Germany.

This cable is of the oil-filled, twisted multi-wire core construction, the lead sheath enclosing the cylindrical conductors, being of an elliptical cross section, whereby falciform longitudinal channels are provided between the surface of each of the conductors and the sheath, these channels being filled with oil.

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No. 1,937,078, WIRE FABRIC MACHINE, Patented November 28, 1933, by Charles C. Wickwire, Cortland, N. Y., assignor to Wickwire Brothers, Cortland, N. Y., a corporation of New York.

The machine is adapted to form wire fabric which is free of distortion, the crossing points being humpless.

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No. 1,937,420, APPARATUS FOR HEAT TREATING WIRE, Patented November 28, 1933, by William H. Wood, South Euclid, Oscar C. Trautman, Parma, and William E. Benninghoff, Lakewood, Ohio; said Trautman and Benninghoff assignors to said Wood.

This apparatus is adapted for the simultaneous heating of a number of wires through the medium of electricity, there being a number of wires contacting with each contact member and constituting a multiple-circuit path for the current.

✦ ✦ ✦

No. 1,937,767, WIRE TENSIONING AND TYING MACHINE, Patented December 5, 1933, by Frank H. Lennox, Seattle, Wash.

This is a hand operated wire tensioning and tying machine, the invention lying largely in a wire gripper associated with the machine.

✦ ✦ ✦

No. 1,938,308, ELECTRICAL INSULATION, Patented December 5, 1933, by William Bryant Wiegand, South Beach, Conn., assignor to Binney & Smith Company, New York, N. Y., a corporation of New Jersey.

More particularly, the invention covers an insulation for wire conductors, the insulation including dry raw carbon black which, it is claimed, in proportions of between 1.4% and not over 3% by weight, adds to the dielectric qualities of the insulation.

✦ ✦ ✦

No. 1,938,489, SPRING ASSEMBLY, Patented December 5, 1933, by Charles D. Karr, Holland, Michigan.

The invention lies in the wire spring connectors for spiral springs in spring cushion assemblies and the like. The last turn of the spring is not a spiral but the portions thereof are disposed at angles to each other with the extremity crimped.

✦ ✦ ✦

No. 1,938,626, INSULATED CONDUCTOR, Patented December 12, 1933, by John W. Greenleaf, Hamden, Conn., assignor to Rockbestos Products Corporation, New Haven, Conn., a corporation of Mass.

This conductor comprises a core member having a compacted mass of felted interentangled fibres thereon, comprising mainly asbestos, and a reinforcing filament embedded in the mass and extending parallel to the core member the entire length of the covering.

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No. 1,938,627, METHOD OF AND APPARATUS FOR MAKING INSULATED WIRE, Patented December 12, 1933, by John W. Greenleaf, Hamden, Conn., assignor to Rockbestos Products Corporation, New Haven, Conn., a corporation of Mass.

This invention covers an apparatus for manufacturing the wire conductor assembly previously described.

✦ ✦ ✦

No. 1,938,668, ELECTRIC CONDUCTOR, Patented December 12, 1933, by Edwin J. Schneider, Jamaica, and Merritt B. Bradt, Brooklyn, N. Y., assignors, by measne assignments, to General Cable Corporation, New York, N. Y., a corporation of New Jersey.

This conductor comprises a flat outer covering enclosing a pair of wire conductors as well as the ground wire, the conductors, with their insulating coverings being arranged side by side with the ground wire between them.

✦ ✦ ✦

No. 1,939,020, AUTOMATIC WIRE CLIP FORMING AND CLOSING MACHINE, Patented December 12, 1933, by Harry Carl Pass, Toronto, Ontario, Canada, assignor of one-half to Walter W. Cumming, and one-half to Henry Walter Stuart Cumming, both of Toronto, Ontario, Canada.

More specifically, the invention covers a new wire cutting means for association with a wire clip forming and closing machine such as is used in the construction of clips for connecting together spiral springs.

✦ ✦ ✦

No. 1,939,021, AUTOMATIC WIRE CLIP FORMING AND CLOSING MACHINE, Patented December 12, 1933,, by Harry Carl Pass, Toronto, Ontario, Canada, assignor of one-half to Walter William Cumming and one-half to Henry Walter Stuart Cumming, both of Toronto, Ontario, Canada.

In this invention, the machine is adapted for actually manipulating the wire clip so as to pass it about associated spiral springs, such as are employed in cushion construction.

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Richard E. Brown, 17 East 42nd St., New York, N. Y.

Effect of a Backward Pull Upon the Tension Required to Draw Wire

Some observations by Kenneth B. Lewis, consulting wire mill engineer, on the paper published in the December issue of "Wire & Wire Products" under the above title and written by Prof. Thompson of the University of Manchester.

In the December issue of WIRE & WIRE PRODUCTS, the paper by Professor Thompson of University of Manchester entitled "Effect of Backward Pull Upon the Tension Required to Draw Wire" was published.

✦ ✦ ✦

PROFESSOR THOMPSON'S papers on wire drawing are always interesting, and this one is particularly so because it will probably be through this "backward pull" technique that we shall get our first clear analysis of stresses in the die and our first correct conception of that sort of plastic flow which takes place in wire drawing.

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THE fact that a backward pull has significant and predictable effects on the tension required to draw wire, and on the pressure in the die, will not be news to readers of Wire and Wire Products. What is new, however, is the curious relationship shown in figure 2, from which it appears that the tension required to bring the wire through the die against a counterweight equals the normal die pull plus a percentage of the weight of the counter which is constant in each set of determinations.

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WHILE this relationship certainly exists, its statement in this form is confusing, and tends to obscure the real effect of back pull. The wire, before it will flow, must be stressed up to the mean yield point of that portion which is in contact with the die. When the flow begins friction starts, and it, too, is directly dependent on the mean yield point, which determines the pressure between die and wire. Therefore both the factors in die pull, the force required to deform and the external friction, are directly dependent on yield point. This is all based on the assumption that the stresses are developed in the die, and resisted by the die walls.

✦ ✦ ✦

WHEN the wire reaches the die already under stress, as in the case of a counterweighted wire, the pressure in the die, and therefore the work that the die must do, is decreased. The decrease is clearly due to the prestressing, and can be shown to be directly proportional to it. The tension required to bring such a wire through the die is a certain precentage of normal die pull, plus the counterweight. In other words the counterweight is clearly a "fixed charge" while the amount of work in the die varies. The upper branches of Professor Thompson's curves in figure 2 imply on the other hand, that the work in the die is constant and that only a percentage of the counterweight affects the final tension. I know very well that Professor Thompson does not intend to convey that impression, for his own words show that he is in agreement with my explanation, but the presentation of the results in the form in which they appear does at first seem to contradict the facts.

✦ ✦ ✦

THE curves in figure 2 show that in one case 68½% and in the other 73% of the counterweight added to the normal free die pull gives the tension required. It never occurred to me to search for such a relationship but since reading this paper I have checked my own data and find it in agreement. On each set of determinations in the same die, with the same wire, the percentage figure is very steady. My figures range from 33 to 78, through a considerable range of die angles, reductions, and conditions of the metal and its surface. The variation of the figure from one determination to another has no logical basis that I can detect. There appears to be a tendency toward a lower figure with small angles, and a stronger tendency toward a low figure when working with an annealed wire and a substantial draft, but neither tendency is steady enough to bank on. Within each set of determinations, that is, with no variable but the counterweight, the figures are in excellent agreement, as Professor Thompson's results indicate.

Kelly Wire Die Corporation

✦

TANTALUM

TUNGSTEN

&

DIAMOND

DIES

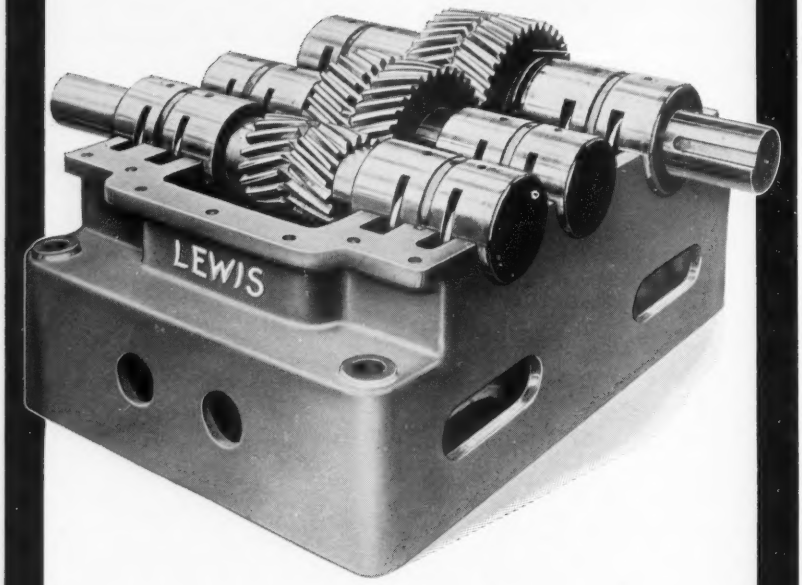
✦

Kelly Wire Die Corporation

Vascoloy Ramet Agents

256 W. 31st St., NEW YORK

LEWIS HIGH SPEED GEAR SET



FOR CONTINUOUS ROD MILL

Lewis High Speed Gear Sets are in use where quality and efficiency really count. The largest and most up-to-date rod mill unit in the world utilizes Lewis Gear Sets for driving its roll stands.

Lewis gear housings are of two piece type with special alloy forged steel herringbone cut tooth gears running in babitted shell type or roller bearings. One Lewis gear set is used for driving two roll stands which is a special feature for controlling roll speeds when driven by either individual motors or bevel gear drives. Lewis gear sets are totally enclosed and gears and bearings run continuously in oil.

Lewis Engineers will gladly cooperate with you in designing special machinery to meet your problems.

LEWIS

P. O. BOX 1591
PITTSBURGH, PA.

LEWIS FOUNDRY & MACHINE CO.

Cable Improvements During 1933

THE improvement of the standard type of cable and the development of new compounds rendered possible an advancement in certain operating characteristics.

✦ ✦ ✦

FUNDAMENTAL research on paper insulation, both of the solid and oil-filled types, permitted the isolation of certain factors which contributed to the deterioration of insulation of this type, and methods for counteracting the effect of such factors were determined.

✦ ✦ ✦

Glyptal Treated Cloth

IN the varnished-cambric field, Glyptal-treated cloth, an entirely new type of insulation, made its appearance. It is capable of operating at temperatures as high as 90 to 95 deg. C., is even more oil resisting and moisture resisting than is the ordinary cambric, and is good for potentials up to 7500 volts.

✦ ✦ ✦

New Rubber Compounds

RUBBER cable has many advantages at low and moderate voltages over other types but has been limited in its application by the relatively low temperature at which it can operate safely, and by the relatively low-voltage limitation placed upon it by its susceptibility to damage from corona.

✦ ✦ ✦

RECOGNIZING these limitations, three new types of rubber compounds were developed, namely, a heat-resisting compound, a corona-resisting compound, and a moisture-resisting compound. The heat-resisting compound may be operated at temperatures as high as 75 deg. C., and should find many applications in places where varnished cambric was formerly considered necessary. Corona-resisting compound raises the voltage maximum at which rubber cable may be operated.

THE moisture - resisting compound was developed as a result of the fact that ordinary rubber, while highly resistant to moisture, is not entirely impervious. The special compound represents a great improvement on the standard type of rubber compound in this respect, and is especially useful for such applications as submarine work, or where low leakage current is important, as in signal work.

✦ ✦ ✦

A NEW type of rubber compound known as Performite insulation (35 per cent rubber compound) has an ageing characteristic much better than the older type of performance test rubber, which, in turn, represented an advance over the 30 per cent A. S. T. M. compound which it was designed to replace.

✦ ✦ ✦

THE 60 per cent tellurium compound, was further improved so that modern portable or drag cables, such as are used in construction and mining work, are now tougher and more durable than ever.

✦ ✦ ✦

New Type Lead Press

IT has long been recognized in the field of high-tension cable that more failures were due to defects in the lead sheath than were caused by trouble in the insulation itself. In order to remedy this condition a special lead press was provided which is capable of producing a seamless and weldless lead sheath of uniform quality. In the ordinary type of lead press, the stream of lead divides in the die just above the cable, and reunites at the top and bottom of the cable, making two welds. When, as sometimes happens, slag, dross, and oxides are carried into the molten metal and deposited in the weld, weak spots are formed in the lead sheath, which may be the cause of trouble in service.

✦ ✦ ✦

IN the new press, the lead stream is not separated and reunited and thus the welds are eliminated, and with them the trouble-producing weak spots.

The moral of this advertisement is, of course, BE SURE YOU HAVE A CONSISTENTLY EFFICIENT AND DEPENDABLE HIGH PRESSURE PUMP.

The very latest Robertson Vertical Triplex Plunger Pump shown above is the result of 75 years' experience in designing and building Hydraulic Machinery. The "first cost" of this pump may be a little higher, but the operation and maintenance costs are so low that it is considerably cheaper in the long run.

Ask for our NEW FOLDER of facts.

Robertson Products Include:

Lead Encasing Presses for Cable and Rubber Hose,—Extrusion Presses for Non-ferrous Metals, — Lead Strippers, Melting Furnaces, Pots, Dies, etc.—and, of course, the well known Robertson Hydro-Pneumatic Accumulator and High Pressure Hydraulic Pump.

Note: If you would like to be placed on our mailing list to receive regular issues of our little House Organ entitled ROBERTSON REMINDERS,—just send us your name and address.

John ROBERTSON CO. INC. Pioneers~Since 1858

125-137 Water Street Brooklyn, N. Y.

Bell Mine Products

AMERICAN LIME & STONE CO.

Bell Mine

Rotary Kiln

Pulverized

Lime

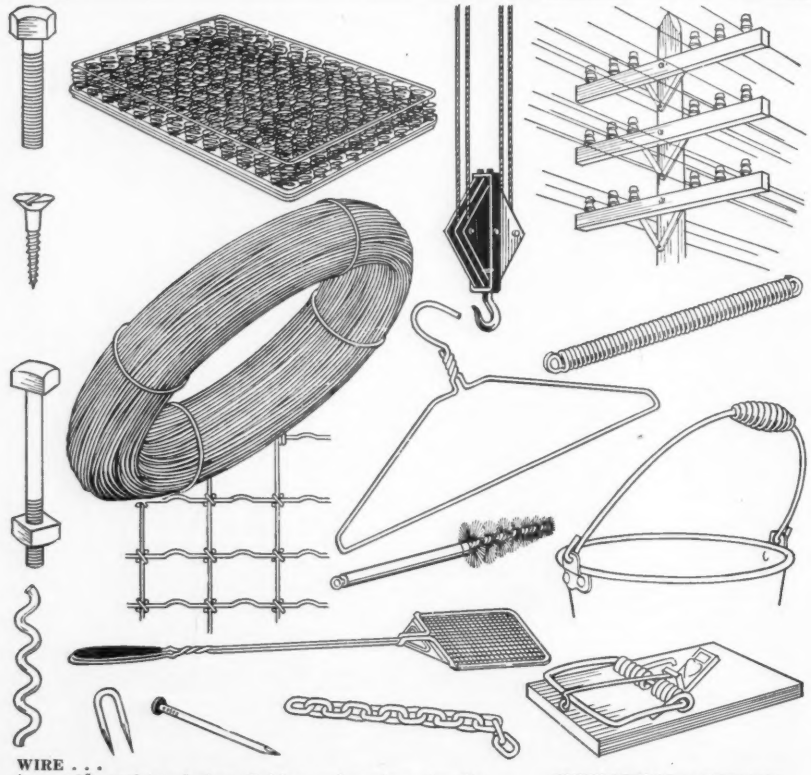
Free from grit and impurities

PLANT and EXECUTIVE OFFICE

BELLEFONTE, PA.

NRA MEMBER U.S. WE DO OUR PART

Sales Offices: PITTSBURGH PHILADELPHIA NEW YORK CITY



WIRE . . .
in a wide varlety of sizes, finishes and analyses for the manufacture of products that require a special wire. Your inquiry will receive the careful attention of an organization experienced in furnishing uniform high quality wire that improves your product and reduces its cost.

KEYSTONE STEEL & WIRE CO.,
PEORIA, ILL.

Annealing Low Carbon Steel Wire

(*Continued from page 40*)

Operation of the Equipment

THE operation will, of course, depend on the nature, size and weight of the wire constituting each individual charge. A typical charge of 6000 lbs. of 13½ gauge wire, annealed dead soft for redrawing requires a heating time of 8 hours in the furnace, with a furnace temperature of 1350° F. and a fuel consumption of 2,000,000 B.t.u. or less per Ton, which is the equivalent of 13 gallons of fuel oil, 2000 cubic feet of natural gas or somewhat less than 4000 cubic feet of coke oven gas.

✦ ✦ ✦

UPON completion of the heating cycle, (which may vary from 6 to 9 hours depending on the tonnage in the pot and the nature of the material), the pot and its contained charge are lifted to a cooling hole, and the hot furnace pit is immediately recharged with a previously loaded pot. The entire cycle of discharging and recharging the furnace requires a remarkably short time, due to the pot arrangement discussed above, and the labor requirements are therefore kept at a minimum. This is further enhanced by the automatic control of the burners, so that little more than an occasional inspection of the pyrometer chart is required. After cooling for a period (usually between 12 and 16 hours) the wire is removed and the pot reloaded.

✦ ✦ ✦

Equipment Capacity

AS installed in several wire mills, the equipment consists of the furnace proper, 4 alloy pots, 2 cooling holes and 2 pre-heating holes. Such a unit will have a capacity of 250 to 300 tons per month of continuous operation, and any number of multiple units may be installed, as determined by the capacity requirements of the mill in question.

AS compared to the old type annealing pits, in general use at the present time, one of these new furnaces occupies practically the same amount of floor space as one of the old type pits. Inasmuch as each of the new furnaces turns out two to three times as much tonnage as each of the old type pits, it will be seen that considerable floor space is saved with this new equipment. Also, since the annealing time cut down, the amount of material in process has been reduced and shipments have been speeded up.

With a multiplicity of such units it will be appreciated that a high degree of flexibility is attained, permitting the simultaneous annealing of various types of products requiring different time temperature cycles.

✦ ✦ ✦

Pot Life

AFTER a period of almost three years of practically continuous operation, the original light alloy pots are still in service, and have cost practically nothing for maintenance and upkeep, repairs having been very minor and limited in extent.

✦ ✦ ✦

Other Uses

BESIDE the annealing of low carbon steel wire, work has also been done with these equipments on the bright annealing of steel wire, using the inexpensive "Elfurno" gas recently developed by The Electric Furnace Co. These furnaces are also being used for the annealing of copper and bronze wires. "Normalizing" of .30-.37C rod for cold heading may also be carried out in these furnaces, except that where both rod and wire are to be handled, the furnaces must be large enough to accommodate the rod bundles with their larger coil diameters, and so arranged as to suitably take care of the smaller diameter wire pots also. In a similar way this also applies to the spheroidizing of these products and the alloys such as S.A.E. Numbers 2335 and 3135.

Reliable Insulating Is Vital

We manufacture the famous

Johnson Super Production Tubers

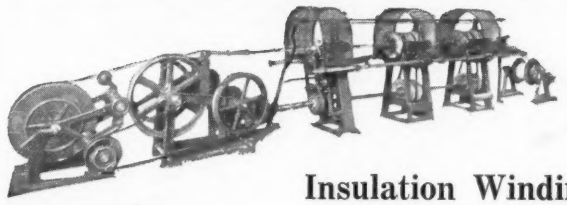
that insure Speed, Uniformity, and Quality in covering wire with rubber.

Write for bulletin.

NEW ENGLAND BUTT CO.

Dept. -W-2, PROVIDENCE, R. I.

Chicago Office, 20 North Wacker Drive



HIGH SPEED BALL-BEARING

Insulation Winding Machine

for applying two tapes from concentric rolls and a cotton binder. Machine has automatic stops for broken tapes or exhausted rolls of tape. Can be built for any number of tapes.

EST. 1855 AIMCo INC. 1915

"American" INSULATING MACHINERY COMPANY

REG. U.S. PAT. OFF.

517 West Huntington St.

PHILADELPHIA PENNSYLVANIA U.S.A.

Patents—Trade Marks

Before disclosing your inventions to anyone send for blank form "Evidence of Conception" and instructions "How to Establish Your Rights".

All cases submitted given personal attention by members of the firm. Information and booklet free.

Lancaster, Allwine & Rommel

PATENT LAW OFFICES

Suite 438, 815-15th St., N.W. Washington, D. C.

Thomson-Judd Wire Machinery Co. Elects A. R. Petterson, Vice-Pres. and General Mgr.

AT the meeting of the stockholders of the Thomson-Judd Wire Machinery Company, which is a subsidiary of the Thomson-Gibb Electric Welding Company with factories at Lynn, Mass and Bay City, Michigan, the following officers and directors were elected:

President—George A. Cutter.

Vice-President and General Manager—Arthur R. Petterson.

Secretary—Daniel J. Lyne.

Treasurer—A. P. Reed.

Assistant Secretary—W. T. Ober.

✦ ✦ ✦

DIRECTORS are George A. Cutter, Arthur R. Petterson, W. H. Gibb, A. P. Reed, W. T. Ober.

✦ ✦ ✦

THE offices of the Thomson-Judd Wire Machinery Company are located at Lynn, Mass.

BALLOFFET

The Quality Diamond Dies

1870 1934

BALLOFFET DIAMOND WIRE DIES CO. INC.,
13-15 East 22nd Street, New York City
Factories in France: Lagnieu-Cluses-Trevoux

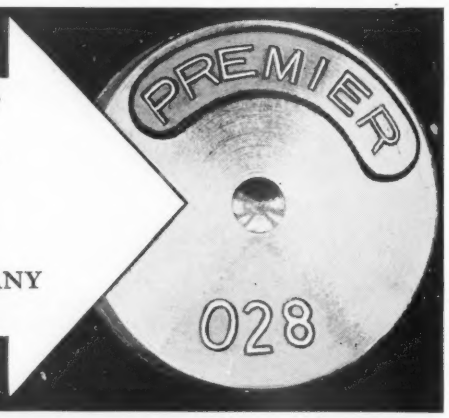
BISCO

TUNGSTEN CARBIDE
TANTALUM CARBIDE
DIES FOR
WIRE, ROD and TUBING

BARE NIBS—SEMI-FINISHED—FINISHED
ROUND AND SPECIAL SHAPES

THE BISSETT STEEL COMPANY
CLEVELAND
PITTSBURGH BUFFALO CINCINNATI

"PREMIER"
Trade Mark Reg. U. S. Pat. Off.
Diamond Dies
made by
DRIVER-HARRIS COMPANY
Harrison, N. J.



STILL SERVING THE WIRE INDUSTRY
AS ONLY A PIONEER CAN

WIRE DRAWING SOAPS
FOR EVERY PURPOSE

THE J. T. ROBERTSON CO., INC.
SYRACUSE, N. Y.

Card Wire

(*Continued from page 46*)

strand generally ran in the open to aid the operator in judging temperature, and naturally finished black. There is even today a small demand for black tempered card wire. In addition to round wire there is required a certain amount of shaped wire in various sizes, the shapes being described as "convex" and "angular". The shaping is worked out during the wet drafts after the last patenting.

✦ ✦ ✦

THE finished product is taken up on 16″ blocks. Its tensile strength runs in the neighborhood of 230,000 lbs. per square inch. Bend tests are a matter of kinking in the fingers, but various forms of fatigue testing are now beginning to be used as a gauge of the probable life of the wire in card form. Accuracy and uniformity of size is insisted upon, and straightness is of prime importance. A piece of tempered wire several feet long cut from the coil and thrown on the floor must snap out into a straight line. It is a curious fact that card wire as delivered from the wire blocks generally has all the physical properties desired in the product except straightness, but the only safe way to get it straight is to temper it.

✦ ✦ ✦

IN one of its many applications card clothing suffers competition from a natural product. Carding is done to lift up the nap of various fabrics to give special finishes. Some of these specialties, as for example broodcloth, must be processed while wet. Steel card wire rusts out too badly for such work. Brass wire as a rule lacks the necessary stiffness. What is used is a "teasel", the spiney pod of a plant, whose thorns are very keen and are crooked at the end to an effective degree. These pods, strung on steel spindles, lift the nap and produce the desired finishes. Their life is short and their use is a nuisance. Efforts are being made, already with some success, to substitute for the teasel card clothing made with stainless

steel, and "teasel wire" may soon appear in our code books.

✦ ✦ ✦

IN addition to strictly carding jobs and such related work as has just been described, card clothing has found many other applications and is continually finding more. It has been used as belt conveyors for delivering fibrous material up steep inclines. Shredding tobacco for cigarettes is one well known application. Many an old file has gone back into service after a session with a hand card. "Cat cards" have assisted at the toilet of many an Angora, as well as many a Pekingese. A small but steady outlet is the Beauty Shoppes of Harlem where, it is whispered, much wool is carded that never saw a sheep.

✦ ✦ ✦

Controlling Accidents In Wire Mills

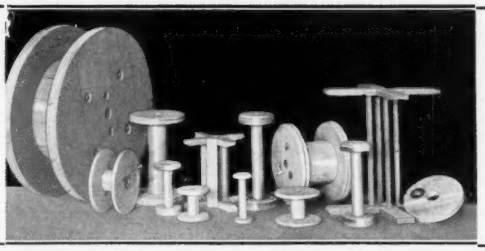
(*Continued from page 43*)

cident severity rates of these 26 different departments. It will be observed (from the tabulation printed on this page) that the "Rod and Wire Mills" department ranks No. 15 in favorableness of accident frequency rates, among the twenty-six different departments listed. Also this department ranks No. 8 in favorableness of accident **severity** rates.

✦ ✦ ✦

IT will be interesting also to study the tabulation of individual department reports for "Rod and Wire Mills." There are reports from thirteen different departments which vary in man-hours worked from 132,000 to 1,337,000. The unit with the lowest number of man-hours reported a perfect 1932 accident frequency rate; and the unit with the largest number of man-hours made the second best accident frequency record—2.25; and also the second best accident severity rate—.12. The remaining eleven units had accident frequency rates varying from 4.80 to 80.18; and accident severity rates varying from .19 to 8.63. Incidentally, the unit with the third best accident frequency rate (4.80) had the highest accident severity rates—8.63.

WOODEN SPOOLS REELS and BOBBINS For WIRE and CORDAGE MILLS



WRITE FOR PRICES

✦ ✦ ✦

AVOCA MFG. CO.
AVOCA, N.Y.

Learn about PARALAN

Paralan will give your finished wire and wire products protection from atmospheric corrosion in the mill and in shipping. Paralan-coated wire can be spot welded or soldered without cleaning. Also, Paralan leaves surfaces in good condition for all types of finishes—enameling, japanning, lacquering, plating, etc.

Write for further information. We may be able to solve your difficulties.

AMERICAN LANOLIN CORP.
LAWRENCE, MASSACHUSETTS

German Manufacturer Of Machinery offers for sale

their U. S. A. Patents Nos. 1,861,563 and 1,924,839 relating to:
HIGHEST CAPACITY CONTINUOUS WIRE DRAWING MACHINES
which are unsurpassed in their high production and economy of operation. They will be sold outright or granted on license.

Please address reply to M. H. 313, this magazine.

EFFICIENT PICKLING
REQUIRES "RODINE"

RODINE, SAVES ACID AND METAL.
Prevents over-pickling. Minimizes acid brittleness and acid fumes.

Samples and Directions sent on request.

AMERICAN CHEMICAL PAINT CO.
AMBLER, PA.

Detroit Office & Warehouse 6339 Palmer Ave.; E.

THE wide variations in the reported accident experiences of the different units, among all of the divisions of wire manufacturing operations which have been mentioned, seems to prove conclusively that accidents in Wire Products operations are largely controllable and that some companies have achieved the art of this control.

"DOING ONE BIG THING WELL"

INHIBITORS EXCLUSIVELY
The WM. M. PARKIN CO.
PITTSBURGH, PA.

✦ ✦ ✦

Patents

(*Continued from page 54*)

No. 1,939,301, INSULATED ELECTRICAL CONDUCTOR, Patented December 12, 1933 by Mortimer T. Harvey, East Orange, N. J., assignor to The Harvel Corp., a corporation of New Jersey.

This cable comprises a conductor of copper wire and insulation thereon made of cashew nut shell liquid material and which is the result of the catalytic effect of the copper of the conductor wire on the cashew nut shell liquid material under the influence of heat.

EACH succeeding day is the scholar of its predecessor. Each experience makes us more dependable

W. H. SPOWERS, JR.

Enquirer wishes to have details of a small wire weaving plant for sale.

✦ ✦ ✦

Indicate number and size of looms and sales terms with lowest prices. Replies to Box No. 1, c/o Wire & Wire Products, 17 E. 42nd St., New York, N. Y.

Kenneth B. Lewis
CONSULTING ENGINEER
Wire Mill Equipment, Layout and Practice
17 East 42nd St. New York City
43 Midland St. Worcester, Mass.
Phone: Murray Hill 2-4188
Phone 5-6033

W. H. Spowers, Jr.
Consulting Engineer
551 Fifth Ave., N. Y. C.
Specializing in Galvanizing Plants Designed and Installed
Practical Engineering
Vanderbilt 3-7395 Advice

WIRE MILL EQUIPMENT
MORGAN CONSTRUCTION CO.
WORCESTER, MASS.

Wire Mill Equipment, Stranding, Insulating, Drawing, Welding
Thomson-Judd Wire Machinery Co.
Subsidiary of
Thomson-Gibb Electric Welding Co.
Lynn, Massachusetts.

VIANNEY
Famous Wire Drawing Diamond Dies
250 EAST 43rd ST., N. Y. CITY

New HOTEL EDISON
47th ST.
JUST WEST of B'WAY
NEW YORK
1000 ROOMS
EACH WITH BATH AND SHOWER
Circulating Ice Water . . . Radio . . .
Large Closets . . . Full Length Mirrors
OTHER UNUSUAL FEATURES
SUN-RAY HEALTH LAMPS
Roof Solarium . . . Air-Cooled Restaurant
ROOMS from $2.50 SUITES from $6.00
IN THE HEART OF TIMES SQUARE

Spring Design Makes High Speeds Possible

THE new passenger locomotives for the Pennsylvania Railroad, with their speed of 90 miles per hour, are possible because of painstaking attention to detail. Each little part must do its duty or the whole becomes useless. For instance, each motor pinion contains several springs to allow flexibility. It might seem simple to obtain these springs but it was not. The best which could be found fell far short of being good enough. They would fatigue and break under the stress and vibration of service so new springs were developed after a long period of study and testing. The new springs call for a new material, a new system of winding, new heat treatment and new finish and the result is a spring which will have twenty times the life of old springs.

ZINC STRIP WIRE
THE PLATT BROS. & CO.
WATERBURY, CONN.

Broden Construction Co.
Wire Mill and Cold Rolling Equipment
10255 Harvard Ave.
CLEVELAND, OHIO

WIRE DRAWING MACHINERY AND EQUIPMENT
Rod Frames—16" Frames, 8" Frames —Take-Up Frames, Wire Pointers—Puller Tongs.
General Castings for Wire Mill use.
Circulars on Request.
E. J. Scudder Foundry & Machine Co.
Trenton, N. J.

WIRE STRAIGHTENING AND CUTTING MACHINERY
FOR ALL SIZES, SHAPES AND KINDS OF WIRE
The F. B. Shuster Co.
New Haven, Conn.
Straightener Specialists Since 1866

JOHN ROYLE & SONS
PATERSON, NEW JERSEY.
MAKERS OF EXTRUDING MACHINES FOR COVERING ELECTRIC CONDUCTORS AND WELDING WIRE

Wire Drawing Diamond Dies
COCHAUD
WIRE DIE CORPORATION
300 W. 56th ST., NEW YORK
Tel. Col. 5-1340

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For more complete information, consult the annual Directory, Index & Buyers' Guide.

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See Furnaces—Various Headings

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New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

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Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CASTINGS—Wire Mill
E. J. Scudder Foundry & Machine Co., Trenton, N. J.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.

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Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

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American Lanolin Corp., Lawrence, Mass.

COILERS—Sheet and Wire
H. J. Ruesch Machine Co., Newark, N. J.

CRANES—Wire Mill
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

DIES—Diamond
Balloffet Diamond Wire Dies Co., Inc., N. Y. C.
Cochaud Wire Die Co., New York.
Driver-Harris Co., Harrison, N. J.
Kelly Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York.

DIES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Cochaud Wire Die Corp., New York.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Vianney Wire Die Wks., N. Y.

DIES—Rod and Tube Drawing
Bissett Steel Co., Cleveland, O.
Carboloy Co., Inc., Newark, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

DIES—Tantalum Carbide
Bissett Steel Co., Cleveland, O.
Kelly Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

DIES—Tungsten Carbide
Bissett Steel Co., Cleveland, O.
Carboloy Co., Inc., Newark, N. J.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

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Jagielski, Otto, Yonkers, N. Y.
Lewis, Kenneth B., New York, N. Y.

EYELETS—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FURNACES—Annealing
Electric Furnace Co., Salem, O.

FURNACES—Automatic
Electric Furnace Co., Salem, O.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.

FURNACES—Electric
Electric Furnace Co., Salem, O.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
John Robertson Co., Brooklyn, N. Y.

FURNACES—Non-Oxidizing
Electric Furnace Co., Salem, O.

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Morgan Construction Co., Worcester, Mass.
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Amer. Lime & Stone Co., Bellefonte, Pa.

LUBRICANTS—Wire Drawing
Drakefield, B. F., & Co., New York, N. Y.
R. H. Miller Co., Homer, N. Y.
Robertson, J. T., Inc., Syracuse, N. Y.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
John Robertson Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
New England Butt. Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Bunching
Amer. Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Machinery Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Coilers
Broden Const. Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

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Detroit, Mich., Oct. 2-5, 1933

The Wire Association,
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BUYERS' GUIDE, Continued

MACHINERY—Copper Wire Drawing and Rolling
H. J. Ruesch Machine Co., Newark, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Extruding
John Robertson Co., Brooklyn, N. Y.
John Royle & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Forming
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
H. J. Ruesch Machine Co., Newark, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Insulating
American Insulating Machinery Co., Phila.
New England Butt Co., Providence, R. I.
John Royle & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, ets.
John Robertson Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Measuring Wire & Cable
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Machinery Co., Phila.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Morgan Const. Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Lewis F'dry & Machine Co., Pittsburgh, Pa.
United Eng. & Foundry Co., Pittsburgh, Pa.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Lewis F'dry & Machine Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Rubber Strip Covering
Farrel-Birmingham Co., Ansonia, Conn.
New England Butt Co., Providence, R. I.
John Royle & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
John Royle & Sons, Paterson, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila. Pa.
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry and Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Machinery Co., Phila.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Const. Co., Cleveland, O.
Lewis F'dry & Machine Co., Pittsburgh, Pa.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Swaging
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Taping
Amer. Insulating Mach. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Tinsel Rolling Mills
Amer. Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Welding Wire
F. B. Shuster Co., New Haven, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Machinery Co., Phila.
Broden Const. Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Grasselli Chemical Co., Cleveland, O.
Wm. M. Parkin & Co., Pittsburgh, Pa.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.

POTS—Lead Melting
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead Encasing
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
E. J. Scudder Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

REELS AND SPOOLS—All Kinds
Avoca Mfg. Co., Avoca, N. Y.
R. B. Hayward Co., Chicago, Ill.

REEL AND TENSION STAND—
Sleeper & Hartley, Inc., Worcester, Mass.

REEL CRUTCHES
R. B. Hayward Co., Chicago, Ill.
Watson Machine Co., Paterson, N. J.

ROLLING MILLS—See Machinery—Rolling Mill

ROLLS—
Lewis F'dry & Machine Co., Pittsburgh, Pa.
United Eng. & Fdry. Co., Pittsburgh, Pa.

RUST PROOF COMPOUND
American Lanolin Co., Lawrence, Mass.

SOAPS—Wire Drawing
Drakenfeld & Co., B. F., New York, N. Y.
R. H. Miller Co., Homer, N. Y.
Robertson Co., J. T., Inc., Syracuse, N. Y.

STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS
H. J. Ruesch Machine Co., Newark, N. J.

VULCANIZERS
John Royle & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS
American Insulating Mach'y Co., Phila., Pa.

WIRE—Enameled For Coils
Winsted Insulated Wire Co., Winsted, Conn.

WIRE—Manufacturers
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

WIRE—Non Ferrous to Specification
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.
Winsted Insulated Wire Co., Winsted, Conn.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Keystone Steel & Wire Co., Peoria, Ill.

WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

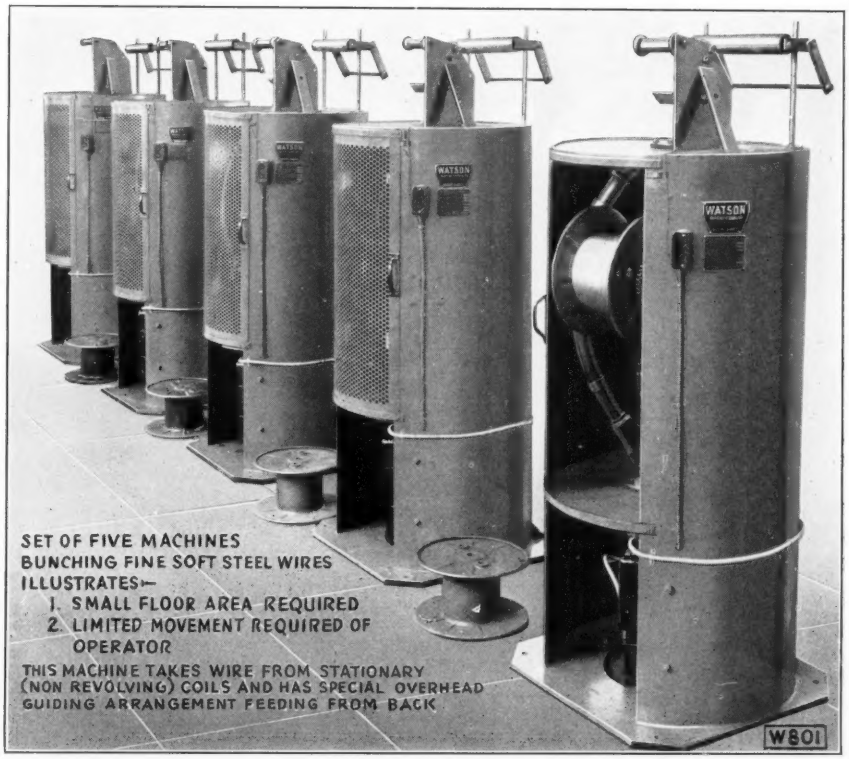
This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.

The Watson Machine Company

ESTABLISHED 1845

Paterson, New Jersey, U. S. A.

Engineers . Founders - Machinists

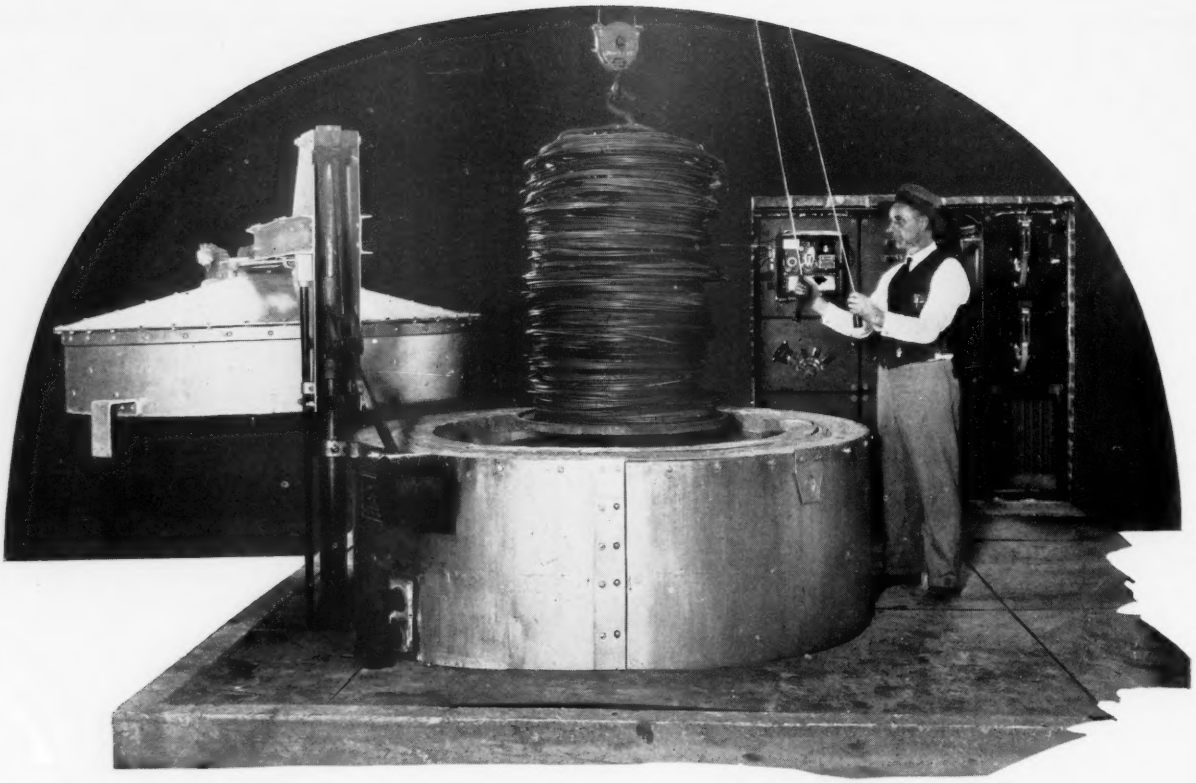

SET OF FIVE MACHINES
BUNCHING FINE SOFT STEEL WIRES
ILLUSTRATES—
1. SMALL FLOOR AREA REQUIRED
2. LIMITED MOVEMENT REQUIRED OF OPERATOR
THIS MACHINE TAKES WIRE FROM STATIONARY (NON REVOLVING) COILS AND HAS SPECIAL OVERHEAD GUIDING ARRANGEMENT FEEDING FROM BACK
WATSON
W801

A modern high capacity installation of five WATSON BUNCHERS V7 for fine wire bunching, for single operator is shown above.

At 1″ lay 42,000 feet of strand is produced hourly.

Small floor area, and automatic electric stops enable single operator to take care of eight machines with ease.

Send for latest bulletin and prices.



Furnaces for the Wire Industry

The above illustration shows one unit of an installation of furnaces made in a prominent steel plant for annealing alloy wire rod in coils, without scale or decarburization,—a special furnace for a special process. Recent developments and installations include several other interesting furnaces for the wire industry, including:

Improved Pit Type Furnaces

For Annealing Steel Wire in Coils, which offers the following advantages:

Increased tonnage per pit.
Improved fuel economy.
More uniformly annealed wire.
Improved surface conditions.
Decreased annealing time and labor requirements.
Maximum flexibility,—wire can be annealed bright or dull.

Continuous Furnaces

For Bright Annealing Copper Wire.

A new continuous furnace for bright annealing fine copper wire on spools. The spools are loaded into trays and pushed through the furnace by hydraulically operated pusher head, pushing at any predetermined intervals. The material is discharged from the furnace uniformly annealed, bright, clean and dry.

Other recent installations include continuous furnaces for billet heating, bright annealing, brazing, carburizing, hardening and other heating and heat treating processes;—put your problems up to our engineers.

WE BUILD THE FURNACE TO FIT THE JOB

THE ELECTRIC FURNACE CO.
SALEM, OHIO.

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ELECTRIC FURNACES